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FOREIGN RAILROADS

A collection of 43 Articles relating to
Operation, Nationalization, Accidents,
Taxation, etc., in England, France,
Belgium, Spain, the Near East, South
America, and the Isthmus of Panama

Taken from the

Annals of the American Academy of Political and
Social Science, Chautauquan, Empire Review,
Fortnightly Review, Journal of the Royal
Statistical Society, Merchants Magazine,
Outlook, Society of Engineers Transactions,
United Service Institution Journal, and
World's Work.

CLEVELAND

1919

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C O N T E N T S

Accidents on Railways in England

Bagdad Railway ✓

British Railway Statistics

Burgess (R.) Military Roads of the Ancient
Romans, compared with Modern British
Railways

Conley (Edward M.) New Isthmian Railroad

Cuban Railroad

Cullen - Panama Railroad

Cullen - Isthmus of Darien and the Ship Canal

Daniel (A.E.) Underground Railway in London

Development of West Africa by Railways

Dietler (Hans) Regulation and Nationalization
of the Swiss Railways I

Dietler (Hans) Regulation and Nationalization
of the Swiss Railways II

French Railroads

Hedjas Railway ✓

History of the English Railways ✓

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commerce 20p22 rec'd
Joule H.H.

Howell (Price) Comparative Statistics of
Australian Railways

Imperial Mexican Railway

India Railroads and the Cotton Trade

Mount Cenis Summit Railway

O'Connor (T.A.) Bagdad Railway

Pepper (Charles M.) Pan-American Railway

Progress of English Railways

Proposed Railroad Across the Isthmus of Panama

Prouty (Charles A.) Railway Discriminations
and Industrial Combinations

Railroad and Canal Statistics: Reading Railroad
Erie Canal and Western Railroad: Comparative
Cost of Railroads

Railroad and their Future

Railroads and Canals of New York

Railroads in India

Railroads in Texas

Railroad, Virginia and Tennessee

Railroads, Indian

Railroads in the United States

Railroad Statistics: France, England, Paris and
London

Railroad Taxation in England

Railroad Travel, Increase of

Railways in Spain.- Pyrenees to be Tunnelled ✓

Railways of France

Railways of Italy

Reduction of Fares on English Railways [follows
Accidents on Railways]

Rost (E.C.) Highest of All Railroads

Talbot (Frederick A.) Railways' Fight for Existence

Troy and Greenbush Railroad [follows Reduction
of Fares]

Victoria Railways Bridge at Montreal

RAILROAD AND STEAMBOAT STATISTICS.

ACCIDENTS ON RAILWAYS IN ENGLAND.

THE usual annual report from the Railway Department of the Board of Trade has just been presented to Parliament for the years 1844 and 1845; from which it appears that in 1844 ten persons were killed, four of whom were passengers, and one hundred and one, eighty-two of whom were passengers, injured in a greater or less degree, the causes of the accident being beyond the control of passengers; that nine passengers were killed, and ten injured, owing to their own neglect or ill conduct; that thirty-six servants of the companies were killed, and twenty-four injured, under circumstances not attended with danger to other portions of the public; and that forty-five persons other than servants of the companies were killed, and nine injured, under circumstances not involving danger to passengers. The report says that the actual number of accidents in the years 1844 and 1845 are greater than they were in previous years; but the real danger arising from railway travelling can only be appreciated when the number of accidents shall be considered in connection with the additional amount of miles of new railway which have been opened, and the enormous augmentation of railway travellers. For this purpose, the following table has been made. It includes the years 1841, '42, '43, '44, and the first half of '45. The last half of '45 is not included, in consequence of the statistical returns for that period not having yet been received from the railway companies by the Board of Trade. The table is entitled—"Statement of the number of 'accidents attended with personal injury or danger to the public, arising from causes beyond the control of passengers,' distinguishing the number of persons killed and injured in the last five months of the year 1840; in each year, from 1841 to 1844, and in the first six months of the year 1845; showing also the number of miles of railway open, the number of passengers conveyed, and the proportion of those injured to the total number carried in each of the above periods."

Years.	No. of accidents.	NO. PERSONS INJURED.			No. miles of railway open.	Total No. of passengers carried.	Prop. of persons injured to the total number of passengers carried.
		Kill'd.	Inj'd, not fatally.	Total.			
Last 5 mo. of 1840,	28	22	131	153	1,330½	6,029,866	1 in 39,410
" 1841,	29	24	72	96	1,556½	20,449,754	1 213,018
" 1842,	10	5	14	19	1,717½	21,358,445	1 1,124,128
" 1843,	5	3	3	6	1,798½	25,572,525	1 4,262,087
" 1844,	34	10	74	84	1,912½	30,363,052	1 356,702
1st 6 mo. of 1845,	15	2	30	32	2,118½	16,720,550	1 522,517

RECEIPTS OF ENGLISH RAILWAYS.

The London Economist furnishes the following table, showing by the amounts received the increase which has taken place in railway travelling, and in the transport of goods by railway, during the three years preceding June 30th, 1845:—

Yr. ending June 30,	Miles open.	Rec. from pass.	Rec. fm. goods, etc.	Total.
1843,.....	1,798½	£3,110,257	£1,424,932	£4,535,189
1844,.....	1,912½	3,439,294	1,635,380	5,074,674
1845,.....	2,118½	3,976,341	2,333,373	6,209,714

The increase of traffic thus shown, is still progressing; a fact in favor of the system of low fares, which is becoming quite popular in England.

REDUCTION OF FARES ON ENGLISH RAILWAYS.

It appears from the last annual report from the Railway Department of the British Board of Trade, that on the Grand Junction Line, 98 miles long, the fares have been reduced, since the 1st of January, 1844, on the first-class, from 24s. 6d. to 17s.; and on the second, from 18s. to 14s. On the Great North of England, 45 miles long, first-class, from 13s. to 9s.; and on the second, from 9s. to 8s. On the Great Western, 118½ miles long, first-class, from 30s. to 27s. 6d.; second, from 21s. to 18s. 6d. On the Leeds and Selby, 6 miles long, first-class, from 2s. to 1s. 4d.; second, from 1s. 6d. to 1s. On the London and Birmingham, 112½ miles long, first-class, from 30s. to 23s.; second, from 20s. to 17s. On the London and Brighton, 50 miles long, first-class, from 12s. to 10s.; second, from 8s. to 7s. 6d. On the London and Croydon, 10½ miles long, first-class, from 2s. 3d. to 1s. 3d.; second, from 1s. 9d. to 1s. On the Southwestern, 94 miles long, first-class, from 23s. 6d. to 19s. 6d., and added a second-class at 15s. On the Manchester and Birmingham, 85 miles long, first-class, from 23s. to 15s.; second, from 17s. to 11s. 6d. On the Manchester and Leeds, 51 miles long, first-class, from 15s. to 11s.; second, from 9s. 6d. to 8s. 6d. On the Newcastle and Carlisle, 60 miles long, first-class, from 16s. to 12s.; second, 12s. to 9s. On the North Union, 22 miles long, first-class, from 8s. 6d. to 4s. 6d.; second, from 4s. to 3s. On the South-eastern, 88 miles long, first-class, from 18s. 6d. to 15s.; second, from 12s. to 10s. On the York and North Midland, 24 miles long, first-class, from 7s. to 6s.; second, from 5s. to 4s. 6d. In addition to these reductions, great facilities and reductions have been afforded by third-class carriages and return tickets, of which no note is taken. Since the close of the year, further reductions have taken place on some of the lines, which, of course, are not included in this report. On the following lines, no reductions have been made:—Birmingham and Gloucester, Hull and Selby, Lancaster and Preston, Midland, and Preston and Wyre. The total length of new railways opened in 1844 was 195 miles 45½ chains; and in 1845, 293 miles 77 chains.

TROY AND GREENBUSH RAILROAD.

This road, which was partially opened for travel on the 13th of June, 1845, extends from the city of Troy to Greenbush, opposite Albany, and is six miles long. It appears, by the last annual report of the directors, made to the Assembly of New York, that the cost of construction to January 1st, 1846, was \$233,371 39. The receipts of the company from June 13th, 1845, when, it will be remembered, the road was only partially opened, to the first of January, 1846, was from 98,711 passengers, \$12,200 86, and from freight, \$3,647 32; making a total of \$15,846 18. The expenses for the same period were \$5,981 21; and the dividends made to stockholders, \$7,843 62. The number of miles run by passenger trains was 13,636; for freight do., 500 miles. The company have three locomotives, and two Troy-built cars, handsomely furnished, and as commodious and convenient as any we have ever seen. The company have judiciously adopted the lowest rate of fare, (12½ cents) two cents per mile. There are no roads in the United States more efficiently managed, or better conducted than the Troy. The "Rensselaer and Saratoga," the "Schenectady and Troy," and the "Troy and Greenbush" railroads, all pass through the main street of the city, and take up passengers at the door of each of the principal hotels, the "Mansion House," the "Troy House," etc.; and although owned by different companies, they are all under the management of Mr. L. R. SARGENT, a most experienced, intelligent, and efficient superintendent; a circumstance which secures the utmost regularity as well as safety. The travel over the Troy and Greenbush road since the last report has been constantly increasing, and we have no hesitation in saying that the stock must soon take rank with the best in the country. The first semi-annual dividend was 4 per cent on the capital invested. The cars leave Troy and Greenbush every hour during the day and evening.

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memorial to Queen Victoria has given great satisfaction in both countries. It will be the first State visit after the period of mourning, and this early meeting between the two monarchs augurs well for a new era in the relations of this country and Germany. For some time past it has been patent that if the peace of the world is to be maintained, the people of Great Britain and the people of Germany must be close friends. This knowledge is at last coming home to both nationalities, and there are on all sides indications of a desire to heal the breach and to shake hands and be friends. This was the earnest wish of King Edward and this is the earnest wish of King George. It only remains for politicians to heal their differences and for common sense to prevail.

THE BAGHDAD RAILWAY

One of the most welcome signs of a more friendly feeling between Great Britain and Germany is shown in the change of attitude adopted by the British Press towards the Baghdad Railway. When the undertaking was first mooted and this country was invited to join with Germany and the other great Powers in constructing the line, the Press of this country actively opposed the proposition. The Government of the day had accepted it in principle, but the party organs, Conservative and Radical, made common cause against the idea, and so Lord Lansdowne was compelled to abandon the position he had taken up, although he and his colleagues were not one whit less eager to see the line made an international line than are the present administration. Sir Edward Grey would have us believe that, now as then, it is only a matter of agreement as to conditions. With all deference to his opinion, I think the situation to-day is very different to what it was a few years ago. Then we had to meet the organised opposition of the Press. To-day there is no such compelling influence at work. Instead of pressure being brought to bear on the Foreign Minister to withdraw, public opinion has veered round, and although conditions are still all-important they do not occupy that overwhelming position before which no government could stand.

In my article last month I made the suggestion that we should lose no time in opening negotiations with the Turkish government as to the Gulf section, and more especially as to that part of it which is to connect Basra with Koweit. My article was, of course, in type before the month closed. On February 9 the *Times* correspondent at Constantinople telegraphs :

Rifaat Pasha, the Minister for Foreign Affairs, has intimated to the British Ambassador that the Porte is desirous of opening *pourparlers* with the British

Government in regard to the questions connected with the Persian Gulf and Mesopotamia. Official circles express the hope that diplomatic conversations will begin in a few days' time. In the meantime the representatives of the Baghdad Railway Company are discussing the prolongation of the railway beyond El Helif with the Minister of Finance. I understand that the rumour that the German Government has officially approached the Porte in regard to proposals for the settlement of the question of the construction of the Gulf sections of the railway is premature.

With regard to the reference to Germany, this again corresponds with the suggestion put forward by me to the effect that Germany and Turkey should also consult together. But my purpose is not so much to emphasise my own anticipations as to draw attention to the common-sense attitude of the *Times* towards what I venture to regard as a most important civilising influence in the Middle East. On the day following the receipt of the above telegram the *Times* offers the following editorial contribution to the solution of the difficulty :

The information which we published yesterday from our Constantinople correspondent, that the Ottoman Minister of Foreign Affairs has intimated to the British ambassador the desire of the Porte to initiate an exchange of views with the British Government in regard to questions connected with Mesopotamia and the Persian Gulf, though not yet officially confirmed, is, we trust, of good omen. If those questions can be settled, as we are firmly convinced they can be, in conformity with the important interests of Great Britain in those regions and with the dignity of the Ottoman Empire, many of the difficulties—perhaps the chief ones—which an arrangement with regard to the Baghdad Railway presents for this country will be considerably mitigated, if not wholly removed. At any rate, if by agreement with Turkey we can uphold our legitimate influence in the Gulf and in Mesopotamia, the political aspects of the Baghdad Railway question will be materially simplified, and it is those aspects which must be the chief matter of concern to British statesmanship.

That is and always has been my case. What we have to do is to secure our legitimate influence in the Gulf and in Mesopotamia. And the only way to obtain this end is by coming to some agreement with Turkey and with Germany. For the exact same purpose as we did Russia also stood aloof, but the Potsdam conversations brought about a complete change of face on the part of Russia, and once that happened Great Britain and France, if not anxious, were at any rate far from unwilling to reconsider their positions. Russia, France and this country are now beginning to see that nothing they can do can prevent the line being built as far as Basra, and this being so obviously no one of these Powers desires to shut itself out from any benefits that may accrue from the undertaking. This country, too, has the all-important purpose in view of keeping control of the territory between Basra and Koweit, and that cannot be done, or at least such control may be jeopardised, by not taking time by the fore-

lock and coming to a satisfactory conclusion with Turkey and Russia over this last section of the Baghdad Railway. France, it may be taken for granted, will follow Russia's lead.

In the course of an interesting article on the railway in the *Journal des Debats*, a contradiction is given to the statement that the attempts on the part of German and French parties to secure the quotation of the railway bonds in Paris failed because the French Government was hostile to the scheme. "They failed because the Russian Government, which was at that time ill-inspired and short-sighted, believed that it was in the interest of Russia to create as many difficulties as possible for an enterprise which it judged to be perilous for itself. Russia refused to recognise that, once the concession had been granted, the construction of the line was inevitable, and that it was infinitely preferable both for her and for France to secure the participation of French capital on a considerable scale, together with a corresponding share in the control and management of the line. She is now paying the price of this error. Since that date the situation has changed entirely to the advantage of the Baghdad Railway Company."* This explanation affords a curious sidelight on the whole proceedings, and indicates the mistake made by Great Britain, France and Russia. In the circumstances it can hardly be expected that Germany and the German syndicate which has financed the line will accept the same terms as they were ready to do before a sod was turned.

All the money required for the first two sections is subscribed, and it only remains to finance the third section. It is no longer any use Great Britain trying to secure the control of the whole of that section. What we must do is to obtain a financial interest in the line and to obtain the greatest interest we can get, but above and beyond all we must ourselves build a line joining Basra with Koweit. That must be an all-British undertaking, and to secure this privilege we must be prepared to give concessions to Turkey and Germany. But we have no time to lose. The longer we delay in arriving at a satisfactory conclusion the more concessions we shall have to make. The railway has got to come and is coming to Basra. For this purpose Germany has secured the concession and the territory is Turkish territory. Nothing France, Russia or Great Britain can do can prevent the railway being built. The only pity is that common sense has taken so long to prevail.

* See *Times*, February 10.

GERMAN NAVY ESTIMATES

The German Navy Estimates have gone through without more opposition, a fact I venture to commend to politicians at Westminster. In the course of his observations, however, Admiral von Tirpitz again referred to Mr. McKenna's statement concerning acceleration which caused so much unrest in this country two years ago. "It is quite an astonishing mistake in England," said the Admiral, "that we have accelerated the construction of our navy outside the provision of the Navy Law. That would only have been possible if the Reichstag had voted us the money for the purpose. In point of fact we have not had a penny for the purpose, and so we have been strangely affected by this assertion that has cropped up in England. There has been no lack on our side of explanation."

In view of this pronouncement it seems hardly creditable that a Liberal Minister should have made the remarks he did, and one can only hope that he will take an early opportunity of offering some explanation as to how he was led into committing so unfortunate a mistake. After all it is not expected that the First Lord of the Admiralty should deliberately make an assertion which has to be officially contradicted by a foreign Power. This is not the way to carry on the naval business of the country. As I have always said our business is to set our own house in order, and not to try and set other people's houses in order. It is an open secret that the Government during the first three years of office since 1905 cut down the naval estimates to such a low ebb that the country would have been in danger had it been attacked. Then to try and get the rank and file of his party to follow him into the lobby and vote his increased estimates the First Lord set about creating a naval scare which alarmed the whole Empire and involved an accusation against Germany which, it is clear from the statement made by the German naval minister, had no foundation in fact.

It is unfortunate that such a mistake should have occurred, and it would be well if Mr. McKenna were to make some explanation from his seat in Parliament. We cannot afford to offend foreign and friendly powers by making statements calculated to offend if these statements cannot be substantiated. I am all for a strong navy, and the stronger the better, and I have sufficient belief even in the Radicals that if facts and not fiction are placed before them they will more readily appreciate the position.

EDWARD DICEY.

The execution of these contracts with the companies will, moreover, require on the part of the state an outlay of about 800,000,000 francs, equal to \$159,000,000; or, adding the two sums together, we have 1,255,000,000 of francs; or, in our currency, \$235,312,500.

BRITISH RAILWAY STATISTICS.

At a recent meeting of the London Statistical Society, Mr. Porter, the Treasurer of the society, read "an examination of the returns made by the various railway companies of the United Kingdom, with respect to their traffic, during the year ending 30th June, 1842." From Mr. Porter's paper, which is of high statistical value, we gather the following particulars:—

The returns for 1843, of 53 lines of railway, of which 41 are in England and Wales, 10 in Scotland, and 2 in Ireland, demonstrate that there were conveyed of passengers of the first class, 4,223,249; of the second class, 10,968,061; of the third class, 6,429,225; and that, with reference to the divisions of the kingdom, the proportions were, for England and Wales, of passengers of the first class, 3,882,171; of the second class, 8,951,070; of the third class, 4,060,321. For Scotland, of the first class, 245,757; of the second class, 877,055; of the third class, 1,529,717. For Ireland, of the first class, 95,321; of the second class, 1,139,936; of the third class, 839,187. The money received from the whole, was 3,063,032*l.*; and the average charge to each passenger in England and Wales, of the first class, was 82*l.*; of the second class, 31*l.*; of the third class, 19*l.* In Scotland, of the first class, 40*l.*; of the second class, 16*l.*; of the third class, 9*l.* In Ireland, of the first class, 10*l.*; of the second class, 7*l.*; of the third class, 5*l.* The great difference that exists between the average fares paid in England, Scotland, and Ireland, is occasioned by the greater length of the English lines of railway beyond those of Scotland and Ireland, and the greater length of the Scottish lines beyond those of Ireland. In the short period between 1833 and 1841, Mr. Porter states the amount of railway travelling throughout the kingdom to have been quadrupled. The amount of receipts from 63 railroads, for 1843, for the conveyance of carriages, horses, cattle, minerals, and general merchandise, was, in England and Wales, 1,303,291*l.*; in Scotland, 104,639*l.*; in Ireland, 6,802*l.* The average cost per mile of the various railways in England, has been 31,522*l.*; in Scotland, 22,165*l.*; and in Ireland, 22,187*l.* Mr. Porter concluded his paper by drawing a comparison of the working of English railways with those of Belgium, the only country in Europe, besides England, in which such works have hitherto been carried on as a system, and where the results have been published. At the end of 1842, there were in operation in that kingdom 282 miles of railway, the average cost of constructing which was 17,120*l.* per mile, about half the cost in the United Kingdom. This difference results from a variety of causes. In the first place, the works being undertaken by the government, there were no expensive parliamentary contests; no opposing interests to be bought off; no unreasonable compensations to be paid for land; and, from the nature of the country, there were comparatively few engineering difficulties to be overcome. Besides these circumstances, there has been much present saving effected in the manner of executing the works, which have been performed in a less perfect manner than would satisfy the magnificent ideas of an English engineer. The number of passengers conveyed along the various lines in Belgium, in 1842, was 2,724,104, there being in Belgium of the first class, 9 per cent; of the second class, 25 per cent; of the third class, 66 per cent; whereas, in the United Kingdom, the per centage was, for the first class, 19; the second class, 51; the third class, 30. The receipts for passengers were, in Belgium, 1*s.* 4*d.* for a distance of 19 miles, against 2*s.* 2*d.* in the United Kingdom, for a distance of 13*l.* miles.

NAUTICAL INTELLIGENCE.

LOSS OF VESSELS ON THE BAHAMA BANKS.

COLLECTOR'S OFFICE, Port of Perth Amboy.

To the Editor of the Merchants' Magazine:—

The recent losses of vessels and lives, on and near the Bahama banks, have awakened much sympathy in every breast, and produced as much wonder at the apathy of the commercial world in regard to these events. It is well known that nearly all vessels bound for ports in the West Indies and the Gulf of Mexico, avoid as much as possible the gulf stream, between the latitudes of 25 and 35 deg. N., and that those bound westward of 80 deg. W. longitude, make the "Hole in the Wall," on Abaco, and then have, in thick and stormy weather, a ticklish and anxious navigation, until they get off the Bahama bank, and ascertain their relative situation, when steering westward through the gulf stream, coursing between Cuba and the Florida Keys. The dangers commence after leaving the light at the "Hole in the Wall." The currents between the south end of Abaco and the Berry islands, are strong and diverse. On the Berry islands, which have so often proved the fatal end of many a voyage, there is no light. From them, when seen, the navigator takes his departure for his course over the Bahama bank. If wind and weather favors, all is well—for the lead, that faithful friend to the sailor, can easily guide the course; but the danger, and a great one it is, is in missing the course, and touching on the Orange Keys. My recommendation to merchants would be, induce the government to unite with England, and other governments most concerned in the navigation of those seas, to place a good light on the northern Berry island. Put a light-ship, well furnished with fog-bell, and other usual appurtenances, midway the channel from the Berry isles to the Orange Keys, in three fathoms water, in about lat. 25 deg. 20 min., and then a beacon, with light, on the Orange Keys. With such a range of lights and precautions, the navigator could cheerfully run his vessel, and merchants and insurers have better hope of safety. I have often wondered, when anxiously going over the track above alluded to, how it could be that the merchants of our country could be so easily induced to trust their vessels, and the lives of their friends, over a navigation so beset with dangers, and yet make no effort to point out to the notice of the government the necessity of some appropriation to meet the case. Vessels and property, it is true, may be insured, and the loss made up; but no insurance can recover back life, experience, and energy; and to this positive loss, insurers should direct their thoughts. A government loses much, indeed, when, by shipwreck, the veteran seaman—the enterprising youth—the man of business, and the fond family, are hurried together to eternity. The late gales in the West Indies have done vast damage; but the damage sustained by loss of life in navigating a critical, yet neglected course, is a reproach on owners, insurers, and government. Awaken the attention of our mercantile community to this subject; and, ere Congress shall convene, something may be done to forward public energy on this important matter. Our growing southern trade demands prompt attention.

Yours, in the cause of humanity.

"AN OLD SALT."

SUNKEN ROCK NEAR THE ISLAND OF ROCKAL.

Mr. Bartlett, of the brig *Guide*, of Hull, arrived in the river, from Montreal, reports that off the small island of Rockal, lat. 57. 39. N., long. 13. 31. W., there is a clump of hidden rocks, about 80 or 90 feet in length, and 30 feet in breadth; the main rock, on Rockal, bearing from the outer one W. by N. by compass, distance 8 miles. "On the 15th April, 1844, at 4 A. M., sighted Rockal, bearing N. W., ship lying N. W. by W., strong gales from the S. W. by W., clear weather. Was desirous to keep my reach to the N. W. Not being able to weather Rockal, bore away to round the north end—had my mate aloft, and myself on deck, to look for breakers. Suddenly I found the vessel between the outer rock and the main one, at least eight miles distant. With difficulty I cleared, by hauling the ship suddenly on the starboard tack, being not more than one sea from the broken water—breaks occasionally. They are bad to discern aloft, but their locality may be seen much more readily off deck, by the color of the water. The morning being clear, was able to obtain the bearing and distance pretty correctly."

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No. III.

LECTURES.

June 12th, 1857.

COLONEL THE HONOURABLE JAMES LINDSAY in the Chair.

ON THE MILITARY ROADS OF THE ANCIENT ROMANS,
COMPARED WITH MODERN BRITISH RAILWAYS.

BY THE REV. R. BURGESS, B.D.

I PURPOSE in this lecture to enumerate and describe those great works of the ancient Romans, with a view of comparing their magnitude with the cast iron lines that now traverse a single province of the old Roman dominions. Unpromising as this subject may seem, it has already occupied the attention of archæologists. Nicolas Bergier, the French antiquary, who died in 1623, has left two quarto volumes which he entitled *Histoire des Grands Chemins de l'Empire Romain*. Pratilli, a writer of the last century, has left a book on the *Via Appia*; and Volpi, in his work on *Latium*, treats of the roads which traversed that region. These learned writers, however, tell us nothing of the Macadam's of those classic days, and never rise to the idea of a good turnpike road, with our usual quantity of toll

bars. The Latin grammarians distinguish three different denominations of roads: *Via*, *Actus*, *Iter*. The *Via* answers to the French Route Royale, and was the great main road from one capital or province to another; such were called *Viæ Consulares*. *Actus* we should call a bridle-road, about half the size and dignity of the *Via*, adapted for donkeys and bipeds; and *Iter* seems to be a general term for any path wide enough to travel upon. The office of taking care of the public roads devolved upon the *Curatores*, who appear to have had about the same power to inflict penalties for damages or trespasses as our railway companies have to keep the third class in order. Some grand lines of road were planned and completed during the Republic, but the earliest and most successful roadmakers of the empire were Julius Cæsar and M. Agrippa; of the latter Dion Cassius says, that when he was *Ædile* in the year of the city 721, he restored all the roads without taking a penny from the public treasury. The Emperor Augustus, of whom it has been truly said, that, with all his power and might, he had neither a glass to his window nor a shirt to his back, was magnificent enough to make up the Flaminian way as far as Ariminum at his own expense, and ordered the senators to do the same to all the other roads at their expense; he made also the *Milliarium aureum*, of which I shall shortly say something, and on the occasion of this general repairing of all the roads that issued from Rome, medals were struck in commemoration of the same, with the superscription *Quod Viæ Munitæ sunt*. Nero repaired all the roads in Spain, and I believe modern travellers in that country would like much to see him there again. Vespasian was a great restorer of the public *Viæ*, and Trajan's restoration of the *Via Appia* is immortalized in sculpture. Marcus Antoninus undertook the roads in Germany and in Belgium; and the emperors in succession, however neglectful they might be in other matters, seldom got through their career without a little engineering in this line. Finally, Theodoric is the last of the men of power we read of who repaired roads in Italy. The devastating war of the Goths and Greeks put an end to all such useful enterprises, and the roads became for many centuries almost impracticable. The materials, torn up or pushed from their site, were used for erecting towers of defence, or walls to prevent

incursions of barbarians, and not until civilisation began to dawn did the highways receive any attention from the reigning powers of Italy.

I shall now say a few words upon the materials and construction of the *Viæ Antiquæ*. Vitruvius does not disdain to give directions for making roads; he recommends that the engineer should choose solid ground and level it, and upon this lay his first covering; and that if there be any looseness in the soil, he must consolidate it by means of wooden piles—"Fistucationibus cum magnâ curâ solidetur." We should hardly imagine that this is a subject for poetry, but yet it is from a passage in the Poet Statius that we chiefly learn how a road was commenced. First they cut two parallel furrows, to indicate the width of the road, and then they cut down between those until they came to the hard bottom, and then began the leveling. As the construction proceeded, the road assumed a slight convex shape; the middle or top was called the *dorsum*, or back-bone of the way, or, as it is called in Virgil, "in *aggere viæ*;" roads that were left in the rough material were said to be *munitæ*, but when covered with cut polygonal blocks, it was a "*via strata*," from whence is derived the Italian *strada*. Specimens of this "*opus stratum*" are still existing on the *Via Ostiensis* and the *Via Appia*, in the neighbourhood of Rome, but a piece in the best preservation is on the *Via Albana*, the triumphal way that led up to the temple of Jupiter *Latialis*, on the Alban Mount; the letters *V. N.*, *Via Numinis*, may still be read upon this pavement, which has kept its place for near 2,000 years. All these remains, and many others that might be enumerated about the hills of *Frascati*, *Præneste*, and *Tivoli*, are of the same description, being composed of large polygonal blocks of basaltic lava, found in many places near Rome, particularly in the quarries near the Lake *Regillus*, under the Capuchin convent near *Bovillæ*, also near the sepulchre of *Cecilia Metella*. This sort of stone was called by the ancient Romans *silex*, or *lapis siliceus*, and the places where it was got were called *lapidicinæ siliceæ*; it will be sufficient to offer for your inspection some specimens of this material, which I gathered with my own hands in Italy. The Roman *Viæ* were edged by a step on each side; these were called *crepidines*, *margines*, or *umbones*; they were about nine inches in

elevation. The other materials used in roads were a mixture of broken fragments of all sorts, called "rudus," which we should call in plain English, rubbish; terra cotta, called testa; and that most plentiful of materials used in all the works of Rome, tufo. I also offer some specimens of that article taken from the quarries described by Vitruvius, near Rome. The Roman roads issuing from the gates of Rome, or branching out in the immediate neighbourhood, were twenty-nine in number; they were measured by a thousand paces, Mille Passuum, which is the origin of the word mile, and short round pillars, called milliaria, marked the distances from each gate. In the Forum there was set up a pillar, on which were inscribed the distances from Rome to each city, where the roads respectively had their terminus. The distances were not measured, as has been erroneously supposed, from this pillar or golden milliarium, but they were measured from the gates. This fact of the distances being measured from the gates, is ascertained by the first milliarium on the Via Appia having been found in its place in the Vigna Nari, on the right of the St. Sebastian gate, and the distance of a 1,000 paces being measured by Fabretti towards Rome, was found to coincide with the ancient site of the Porta Capena. The principal roads issuing from the gates of Rome are exhibited on the sketch before you, but you will not expect me to travel with you on them all. I must select two for notice and one for detail, when I have first stated the authorities we have for the names, number, and direction of all the roads in the Western empire. There are three ancient itineraries which have come down to us, enumerating, like a modern *Livre de Poste*, the various roads and distances from place to place. The first is commonly called the Itinerary of Antoninus, because it was made and published during the peaceful reign of the Antonines, the golden period of the Roman empire. During those forty years of peace and good government, the arts and useful public works were encouraged; and it is one of the blessings upon which we may congratulate the profession of architectural science and art, that it flourishes best in the atmosphere of peace and good will on earth. The second Itinerary was discovered at Augusta (Aost), in the possession of a certain Conrad Peutinger, and is known under the name of the *Carta Peutingeriana*; it is evidently of Christian times, men-

tion being made of St. Peter's Church; the orthography betrays the corrupted language of the eighth century, but, notwithstanding these defects of composition and spelling, it is a precious document, and unique of its kind, being the only one that affords us the least information of the state of the world at that period. The third of these ancient Itineraries was found at Bordeaux; it describes the journey from that city to Jerusalem, and is known on that account under the title of the Jerusalem Itinerary; it appears to be of about the same date as the *Carta Peutingeriana*. These are the three documents from which is to be gathered all that can be known of the public roads of the Roman empire. The two ancient *Via* best known to the present world are the *Via Flaminia*, by which travellers from the North enter Rome, and the *Via Appia*, by which they leave it to travel to Naples. The *Via Aurelia*, which led to *Centum Cellæ*, now *Civita Vecchia*, has recently acquired a celebrity which it never enjoyed in ancient times.

The *Via Flaminia*, however, does not proceed in the direction of the modern road to Florence beyond the *Ponte Molle*; after passing that bridge, which is two miles from the gate, the post road falls in with the *Via Cassia*, and the *Via Flaminia* leads into solitudes and Mount *Soracte*. This celebrated Roman road was constructed by *Caius Flaminius*, the unfortunate consul who fell at the battle of *Thrasimene*; at that time the *Flaminian gate* was at the upper end of the *Corso*, under the *Capitoline Hill*, so that it was always reckoned *ad Pontem III*. The *Via* runs through the *Campus Martius*; it ended at *Arimenum*, now *Rimini*, a distance of 222 miles; it passed through *Narni*, *Terni*, *Spoletto*, before it cut through the *Appenines* to reach *Pisaro*, and in some places, especially between the *Ponte Molle* and *Soracte*, considerable remains of it may be traced. The road which I shall rather seek now to describe, and make the object of comparison, is the *Via Appia*, upon which were bestowed the greatest care and expense, both under Republican and Imperial Rome. It was chiefly on the *Appian way* that the great triumphal processions approached Rome from the East; the chariot wheels of *Pompey* and triumphant *Sylla* moved over its pavement, which, in some places, still exists; its splendid sepulchral monuments on each side of it have left their skeletons to mark its

direction ; and we may still stand near the tomb of Cecilia Metella, and imagine, amidst the stillness which now prevails, the shouts of the applauding multitudes which welcomed Cicero from exile. This was called the Queen of Roads, as Statius the poet sings :

Appia Longarum teritur regina Viarum.

This road was first constructed by Appius Claudius, the censor, 310 years before the Christian era ; it was repaired and laid down in many places with new silex by Trajan, and, in all probability, made entirely anew from Beneventum to Brundisium ; several of the milliaria are still standing along the Pontine Marshes, bearing inscriptions which tell us that Trajan laid it down with silex, at his own expense, *silice suâ pecuniâ stravit*, and the dates square with the 104th year of the Christian era. We have a graphic description of the Via Appia given by the secretary of Belisarius in the sixth century, which it will be interesting to hear. "To traverse the Appian Way," says Procopius, "is a distance of five days' journey for a good walker, and it leads from Rome to Capua ; its breadth is such that two chariots may meet upon it, and pass each other without interruption, and its magnificence surpasses that of all other roads. For constructing this great work, Appius caused the materials to be fetched from a great distance, so as to have all the stones hard, and of the nature of millstones, such as are not to be found in this part of the country ; having ordered this material to be smoothed and polished, the stones were cut in corresponding angles, so as to fit together in jointures, without the intervention of copper, or any other material to bind them, and in this manner they were so firmly united, that in looking at them one would say they had not been put together by art, but had grown so upon the spot, and notwithstanding the wearing of so many ages, being traversed daily by a multitude of vehicles and all sorts of cattle, they still remain unmoved, nor can the least trace of ruin or waste be observed upon these stones, neither do they appear to have lost any of their beautiful polish ; and such is the Appian Way." Whatever we may say about our modern railways and great works of the present century, the paving of Appius Claudius, made just 2161 years ago, might be safely recommended to the study of the Curators of Oxford

Street and the Marylebone Vestry the next time they lay their heads together to make a wooden pavement. I shall give but one specimen of the form of those ancient Itineraries to which I have alluded, by taking the journey from Rome to Capua, properly called the Via Appia; the further distance, from Capua to Brundisium, must be considered as an addition made subsequently. The Itinerary of Antoninus gives the stages and distances thus :

Ariciam .	.	.	.	M. P. XVI.
Tres Tabernas .	.	.	.	M. P. XVII.
Appii Forum .	.	.	.	M. P. XVIII.
Tarracinam .	.	.	.	M. P. XVIII.
Fundos .	.	.	.	M. P. XVI.
Formiam .	.	.	.	M. P. XIII.
Minturnas .	.	.	.	M. P. IX.
Sinuessam .	.	.	.	M. P. IX.
Capuam .	.	.	.	M. P. XXVI.

The Via Appia coincides with the modern road that now leads from the church of S. Cesario, where the Via Latina branches out from it, to the church of S. Sebastiano; continual traces of the old pavement may still be seen, as the way runs between the naked masses of sepulchres to the ruins, commonly called Roma Vecchia; a little beyond those ruins, which appear to be the remains of a little castrum, the old via falls in with the modern road to Albano, which leaves Roma by the Porta S. Giovanni Laterano; at ten miles from the site of the ancient Capena gate, which stood under the Thermæ of Caracalla, is to be recognised the site of the ancient Bovillæ; and in going from thence, the Via Appia passes through the slope of the Alban hills, and reaches the Valley of Ariccia; here we find the first great work which belongs to this queen of Roman ways. The modern road passes through the town of Ariccia, but the old via passed beneath it, having to traverse a valley, and to sustain its level. It is here that we find those magnificent substructions to which I have already alluded; the whole extends for a length of 100 geometrical paces, and the greatest depth or elevation is 33 ft., the least 3 ft.; the whole is a solid mass, except three arches, used for economising of materials, and for greater solidity; and I do not perceive that, in the whole sixteen miles which we have now travelled from Rome on this via, there are any great cuttings or levellings

which would pass the ordinary labour of laying down a road; from Ariccia we descend to Genzano, and approach the Lake of Nemi.

The Via Appia, having now reached the edge of the Pontine Marshes, runs in a dead flat to Terracina; the next two stages (*mutationes*) after Ariccia, bring us to names consecrated in sacred history; the Christians of Rome thought it not a journey too far to go out, some thirty-three miles, and some fifty-one, to meet the great Apostle of the Gentiles coming from Puteoli, at Appii Forum and the Three Taverns. But at Terracina it was necessary to cut away the rock, to make room for a passage between Anxur and the sea-shore; the white rocks of Anxur still shine in the sun, as they did when Horace made his journey to Brundisium, and I consider this passage of the rocks of Anxur to have been the second great work in making the Via Appia. Sixteen miles further is the town of Fondi, and it is easy to see that much labour has been expended about that ancient town, and about Itri, in carrying on the straight line of road, but after clearing Formia, near the present Mola di Gaeta, the difficulties must have ceased; the famous Minturnian Marshes might require a large quantity of the *rubus* and *fistucationes* of Vitruvius, to gain a solid bottom, but nothing serious obstructs the engineer until he arrives at Capua, having effected a distance of 142 miles. There is one particular in which the engineering of Roman roads and modern railways coincided, they both pursued a straight line, both filled up hollows, or bestrode vallies and glens by viaducts and bridges, both cut through hills, and cleared away opposing rocks, and even a tunnel is not wanting to compare with some of our own, in the Grotto of Posilipo, near Naples, and the cuttings of the rocks of Anxur may be placed at humble distance with the blasting of the cliff at Dover. But in making these comparisons, it is always to be borne in mind that the ancients had no gunpowder, and wanted all those mechanical inventions which modern science has given us; but even in a comparison of manual labour and quantity of material, it might, I think, be shown that all the great works of the Roman Empire would hardly equal in the aggregate the works which now exist in a single, and that the most contemptible province of the dominions of Augustus Cæsar. Before I proceed to speak of our own great works, I will

enumerate some of those of the greatest celebrity belonging to the ancient Romans. The substructure of the Ariccian Valley may be calculated by cubic feet of masonry, if we may so call these large masses of stone laid one upon another ; taking those substructions at 500 ft. in length, 18 ft. in mean depth or height, and a width of 26 ft. as measured by Pratilli, and supposing the mass to be solid and uniform, we get an amount of 234,000 cubic feet. I have already mentioned the cutting of the rock of Terracina ; another example of great manual labour is to be seen in going from Rocca di Papa to the Via Latina, under the Mons Algidus ; the mount is cut for a considerable distance down to a depth of 50 ft., so as to give a narrow passage, in which the traveller finds himself a prisoner, if any one chose to block up the entrance either way. Again, three miles from Acqualagna on the Via Flaminia, not far from Fossombrone, there is a great work, a narrow passage cut out of a rock, a part of which is even cut through, so that an arch is formed over head ; it appears from traces of inscriptions, that Vespasian was the author of this bold enterprise.

We are all familiar with the Pont de Gard, near Nismes, which I cite because it was a bridge as well as an aqueduct. Perhaps, the greatest work of all is the Via Trajana, leading to his bridge across the Danube ; there, under a perpendicular cliff, a road is ingeniously cut out, and a foundation given to it by means of beams inserted in the rock ; and every one must admire the skill which has overcome such formidable obstacles to making a road. Drawings illustrative of this great work, and a detailed description, may be seen in Paget's work ; the bridge to which the Via Trajana led was the same as that which is sculptured on his triumphal column.

I shall hardly cite as works of human labour the wonder of the Phlegrean fields, in the Bay of Baiæ ; for there the earth has been cut and slashed by the power of volcanic action, and the ground tunnelled in various directions without the intervention of the iron instrument. The poets in these regions made an easy descent to Avernus. Even the grotto of Posilipo is half-formed by nature, and it must be confessed, wonderful as the passages are which are perforated in this alluring region, that the Box Tunnel would

swallow them all, and a single company of railway directors digest them at a sitting. But we have not seen all the magnificence or the industry of the Romans. In the *Itineraries*, published by Wesseling, Gale and Stukeley for Britain, and M. Danville for Gaul and Italy, we may acquire some idea of this branch of Roman economy. From the wall of Antoninus to Rome, and from thence to Jerusalem, that is, from the north-west to the south-east point of the empire, was measured a distance of 3,740 English miles; of this distance 85 miles only were sea-passages, the rest was the road of polished silex, such as I have described. Posts were established along these mighty lines of high road, so that a hundred miles a day might be with ease accomplished. In the time of Theodosius (as the historian Gibbon quotes from Libanius) a magistrate went post from Antioch to Constantinople; he began his journey at night, was in Cappadocia, 165 miles from Antioch, the ensuing evening, and arrived at Constantinople the sixth day about noon—the distance being 685 miles. This, however, is not equal to the speed with which the Tartar couriers go from Constantinople to Belgrade, often accomplishing that distance of 800 miles in five or six days. It is right to mention a fact related by Pliny, as affording an example of the quickest travelling in a carriage I am aware of in ancient times. Tiberius Nero, with three carriages, accomplished a journey of 200 miles in twenty-four hours, when he went to see his brother Drusus, who was sick in Germany.

We shall now turn to a single province of the Roman Empire, and we see with wonder and admiration how its resources of wealth and genius have surpassed all the glory of the then known world. The distance between the two extremities of the dominions of the Antonines, exclusive of sea-passages, was 3,655 miles. I am willing to suppose that this great line of road was laid down with polished stone, and might have cost as much per mile as the *Via Appia*. If we suppose our numerous turnpike roads (some of which were made at a great cost) to be a set-off against the branch roads of the Roman Empire, which were often inferior in construction, then we have about 5,000 miles of railway in Great Britain alone, to compare with the great line which joined Jerusalem with the Firth of Forth. We have no means of estimating the cost of a

mile of Roman road by any audited account of expenses, and it is not easy to make a comparison of labour. The following may help us to form some idea, rather than any estimate. In the high-level Bridge of Newcastle, the quantity of masonry, in piers and in land-arches, approaches, &c., is 681,609 cubic feet, and the cost of that masonry was £120,000. I find this to be about 3s. 6½d., let us say 3s. 6d., per cubic foot, and if estimated by the cost of labour, and the greater difficulty in the transport of material, I doubt whether the old Romans could do it for less. In those magnificent substructions of the Via Appia near Ariccia, we have found by measurement (taking the whole mass) about 234,000 cubic feet. Now the internal mass in all cases was, to use a Vitruvian term, *ad emplecton*, or, as we might call it, rubble; making all due allowance for this, I should not have in the Valley of Ariccia, reckoning the stone-work 5 feet on each flank, more than 100,000 cubic feet, *i. e.* reckoning at 3s. 6d. per cubic foot, about £17,000 worth of real masonry; and this in the tenth part of a mile. In the whole length of the 142 miles to Capua, we do not find more than two other extra works, viz. at Terracina and at Fondi; so that the cost of the Via Appia would not probably exceed £32,000 (the average price of a mile of our railway) above the ordinary expenditure of making a common road. I confess this is a vague calculation, if even it can be called one; but if it should be raised to the utmost stretch of imagination, it would be insignificant, as to pounds sterling, by the side of our leviathan railroads. The following I have on good authority, as the average cost of a mile of railway throughout Great Britain; the cost being, of course, very unequal in different places:—

	£.
Land	6,000
Earthwork	5,000
Tunnelling	3,000
Masonry	3,000, ordinary line
Viaduct and Large Bridges	3,000
Permanent Iron Road	5,000
Stations	4,000
Law Expenses, Engineering, Surveying, &c.	3,000
	£32,000.

If this be multiplied by 5,000, which was the aggregate length of

British railways in 1851, and is now, of course, considerably larger, we have the almost fabulous amount of 160 millions, a sum fully equal to ten times the revenue of all the Roman provinces in the time of Augustus. I have spoken of 234,000 cubic feet of masonry and rubble as contained in one of the great works of the Via Appia; the high-level Bridge at Newcastle alone, as we have seen, contains of masonry 681,609, of rubble 116,396, of concrete 46,224, total 844,229, besides 5,050 tons of iron, of which the Romans knew nothing; the whole cost of this undertaking was £234,450. The cubic feet of masonry in the Britannia Bridge, which we must consider as a viaduct, and the wonder of the present age, is 1,500,000, and the cost, approximately calculated by Mr. Edwin Clarke, was £601,865; the cost of the Conway Bridge, with £38,500 worth of masonry, was £145,190; and finally the Tweed Viaduct is said to contain two million cubic feet of masonry. We have then in these four great works alone—the Britannia and Conway bridges, the Newcastle and Berwick viaducts or bridges, near $4\frac{1}{2}$ millions of cubic feet of masonry; the whole costing not less than £1,280,000. That is to say, if we could find in the Roman Empire one hundred such works as the celebrated substruction of the Via Appia, they would hardly equal in masonry or stone-work these four productions of the “*ultimi Britanni*,” this is independent of such material as the ancient Romans could not procure, and for which we must not charge them;—9,420 tons of iron were employed in the Britannia Bridge, and 5,050, as I have said, in the high-level Bridge of Newcastle. It is probable that whole armies worked at the Roman roads, bridges, and viaducts, and it would not be fair to compare their mechanical apparatus with the scientific inventions of modern times; but it may be doubted whether they ever presented such a union of physical power as was seen one day on the Menai Straits, when 650 men were employed in raising the second tube of the great bridge, of whom 386 were sailors; and although, as I have said, we have but little or no data to go upon for making a comparison of expenditure and labour, yet we may gather enough to maintain the proposition, that all the great works of the Roman empire connected with their lines of communication did not equal the works of a similar kind which now exist in the

island of Britannia. Another thing which hinders us from making comparisons as to cost, *we* have in every line of railway £6,000 per mile for land—Appius Claudius cut through the country of the Volsci without asking the price, and dispensed with all juries for assessing damages. The “*mutationes*” (hovels where they changed horses) were all the stations that occurred on their line—the comforts of law expenses were not known, and I doubt much if the surveyors and engineers got £1,200 a-mile. I wish I could have found how many sestertia Trajan paid for his restoration of the Via Appia, but all the data I have to guide me in the calculation of that expenditure are, that Trajan paved the road out of his own money, *de suâ pecuniâ stravit*; this, however, is more than can be said for many of the projectors of our modern railways—*de alienâ pecuniâ ferro straverunt*, *i.e.* they laid down the iron with other people’s money, might be a more appropriate inscription. When Augustus re-made the Flaminian way to Rimini, he was the sole shareholder, and gave no scrip. Julius Cæsar and Marc Antony raised great works, but they knew nothing about raising dividends; but that which would have astounded them more than an irruption of barbarians, would have been a bill of £1,800 for every mile of road for parliamentary and law expenses; if this be a true average, which I have authority for stating that it is, then we may deduct from the cost of 3,740 miles of Roman road, which led from Scotland to Jerusalem, the sum of £6,732,000; and if those worthies of old time had been called upon to make 5,000 miles of road in the province of Britain, they might have economized 30 millions of our money by paying nothing for land. In estimating the value of a Roman road, therefore, we have to deduct £7,800 a-mile for land and law, and £4,000 for stations, and £5,000 for iron, before we come to the materials they were enabled to use; in other words, the materials of the Roman road and labour would not be more than half the cost of our railways, from the mere fact of certain expenses being absent, which they could not understand; but, although inferior to the Britons of the nineteenth century in the art of spending money, if judged by the present state of the science, they could not be despicable engineers—their levels were chosen on different principles, but their lines of roads passed through the same countries, and gene-

rally in the same direction, as our railways. A diagram taken from an article of the Quarterly Review, written some years ago, exhibiting a general view of the direction of the principal Roman roads in England, shows that on comparing one or two of our principal lines, we shall find that the Great Western, *e.g.* supplies the place, with a little deviation near Reading, of the Roman iter from London to Bath and Bristol; the Liverpool and Manchester, and on to Leeds and York, replace the northern Watling Street; the Eastern Counties follow a Roman way, and so of the rest.

In boasting of the gigantic steps which the art of road-making has taken in our time, we cannot afford to depreciate either the genius or the magnificence of the ancient Romans in this matter. If we have our railway under the cliffs of Dover, Trajan had his road under 2,000 feet of perpendicular cliff along the Ister; if we have our 5,000 miles of rails, the Romans had their 4,000 miles of chosen road, reaching from one extremity of the empire to the other; if we have our leviathan bridges and viaducts, the Romans had theirs over greater rivers and wider vales than we have to deal with; and, finally, if we had our glass bazaar, one-third of a mile long, in Hyde Park, they had a golden palace, which reached a whole mile on the Esqueline Hill. If we rise superior and look down upon the works of the Romans, it is not so much that we have gained in unskilful labour, as in science. Without the iron and the science, their works would be as great as ours; it is in mental rather than in any physical energies, that we have the pre-eminence; it is what our last great poet has called the "divine particle," which has been dilated by Him who gave it to man, that has enabled us to cope with the very elements, and wing our way against wind and tide over oceans and seas unknown to the ancients. The spirit of a man which is in him is capable of knowing the things of a man, and this capability it is the business of all associated bodies to foster and draw out; it is not, perhaps, yet known of what the human thought is still capable, but the blessing of every discovery in art or science which procures fresh enjoyment for man is, that it brings brute force to a discount, and teaches to mankind the lesson of fraternity and peace; and it is not perhaps too much to say that this question of roads, by which all nations of the earth are brought

within the possibility of meeting again on some plain of Shinar, is calculated more than any other human instrument to renew the face of the earth.

June 19th, 1857.

COLONEL THE HONOURABLE JAMES LINDSAY in the Chair.

THE MEANS OF PRACTICALLY APPLYING THE PRINCIPLES OF
MEDICAL GEOGRAPHY, FOR THE PRESERVATION OF
THE HEALTH OF SOLDIERS AND SEAMEN IN FOREIGN
CLIMATES.

BY DR. BIRD, F.G.S.

LAST year I laid before you the principles of Medical or Noso-Geography; in other words, the facts of physical geography and vital statistics, inductively used for investigating the laws under which health and disease are distributed through the human family, and in various latitudes. On that occasion I brought to notice, how that this promising field of research forms only part of medical etiology, or a knowledge of the causes of disease, associated with geographical situation, and the climatology of particular countries; and that if those entrusted with the health of, or in command of, either soldiers or sailors in those countries, would but rightly appreciate the importance of the duties committed to them, they would endeavour to acquire useful knowledge of the influence of climate on health, and of subjects connected with the treatment as well as the prevention of disease.

The more material agencies which geographically regulate not only the diversities of vegetable and animal structure, but the production of disease also, are the geographico-meteorological causes of atmospheric temperature and humidity, measured by isothermal lines, which connect places having the same mean temperature, but which differ sensibly from the lines of latitude. The mean temperatures calculated from an equatorial mean of $81^{\circ} 50'$ Fahr.,

according to Dr. Brewster's formula, and which differ considerably from the mean temperatures obtained by observation, are given in the annexed Table from Daniell's Elements of Meteorology:

	Latitude.	Observed Mean Temperature.	Mean Temperature calculated by Formula.	Difference.
Equator - - -	0 0	81°50	81°50	0°00
Columbo - - -	6 58	79°50	80°90	1°40+
Chandernagore - - -	22 52	75°56	75°10	0°46—
Cairo - - -	30 2	72°82	70°56	1°76—
Funchal - - -	32 37	68°54	68°62	0°08+
Rome - - -	41 54	60°44	60°66	0°22+
Montpellier - - -	43 36	59°36	59°	0°36—
Bordeaux - - -	44 50	56°48	57°82	1°34+
Milan - - -	45 28	57°18	58°28	1°10+
Nantes - - -	47 13	54°68	55°35	0°67+
St. Malo - - -	48 39	54°14	53°85	0°29—
Paris - - -	48 50	51°89	53°65	1°76+
Brussels - - -	50 50	51°80	51°47	0°33—
Dunkirk - - -	51 20	50°54	51°25	0°71+
London - - -	51 30	50°36	50°74	0°38+
Bushey Heath - - -	51 37½	51°20	50°58	0°62—
Kendal - - -	54 17	46°02	47°58	1°56+
New Malton - - -	54 10	48°28	47°53	0°75—
Lyndon - - -	54 34	48°90	49°37	0°47+
Dublin - - -	53 21	49°10	48°65	0°45—
Copenhagen - - -	55 41	45°68	45°95	0°27+
Edinburgh - - -	55 57	46°23	45°64	0°59—
Carlserona - - -	56 16	46°04	45°46	0°58—
Fawside - - -	56 58	44°30	44°26	0°04—
Kinfauns - - -	56 23½	46°20	45°12	1°08—
Stockholm - - -	59 20	42°26	41°57	0°69—
Upsal - - -	59 51	42°08	40°94	1°14—
Abo - - -	60 27	40°00	40°28	0°28+
Umeo - - -	63 50	33°08	35°96	2°88+
Uleo - - -	65 30	33°26	34°38	1°11+

These mean temperatures are usually higher in the same latitude of the old world than of the new, and are greater in northern than in southern latitudes. Thus the isothermal line of 59° Fahr., traverses the latitude of 46° in Europe, but descends to latitude 36° in America. The general causes which disturb the symmetrical distribution of temperature, are, the annual variations of the upper equatorial and lower polar currents of the atmosphere, the difference of contained humidity, the unequal distribution of land and water in various countries, the peculiar nature of the surface land, and its relative height above the level of the sea. All these causes have more or

organizations. Sixteen are miners, 7 from the Independent Labor party, 3 from the Local Committee, 3 are railroad employees, 2 engineers, 2 steel smelters, 2 shipwrights, and 1 of each of the following trades: compositors, masons, carpenters, cotton operatives, iron founders, lithographic printers, furnishing trades, boot and shoe operatives, typographical association, shop assistants, weavers, barge builders, gasworkers, navvies, sailors and firemen, and carpenters and joiners. The affiliations of three of the Laborites are doubtful.

Among the trades unionist group the miners are easily in the ascendency with sixteen members. Fourteen of these are quite independent of the Labor caucus and are perhaps the best representatives of actual Imperial democracy, the free choice by the people of their best men to speak for them in the National Assembly. Unlike many of the other Labor members, the miners' members are not carpet-baggers imposed on an electorate by the party machine in the English way, so incomprehensible to most Americans. Many of the Labor members who live in London have been elected by constituencies all over the north of England. Of the other trade organizations, the railway men and the printing trades have three representatives each; the engineers, shipwrights, and steel smelters have two representatives each; and sixteen other trades have one each. Forty-one members are furnished and supported by unions. Several others have a local trades union backing but are not the official representatives of a single union nor wholly maintained by it. Next there are seven members nominated and supported by an organization called the Independent Labor Party, which, for the sake of brevity and to avoid going into a complicated story may be called the purely Socialist branch of the Labor Party. It is an offshoot of the Social Democratic Federation in which soft handed Socialists like George Bernard Shaw, Sidney Webb, and R. B. Cunninghame Graham stir up their horny handed fellow theorists. In this group is Mr. Keir Hardie, who was its only representative in the last house and who, because of his ability and his Parliamentary experience, is talked of as the leader for the whole Labor party. In that case a pronounced Socialistic line of conduct may be looked for.

The support of these various members is further divided on account of the Labor Representation Committee. This is a coalition of trades unions and Socialists formed to secure Labor members for Parliament. At the last conference in 1905 it had 165 trades unions and 76 trades councils affiliated with three large bodies of Socialists and a total claimed membership of 900,000. Each trades council (an association of local trades unions) pays about \$10 per year, and other organizations such as local trades unions and socialist societies pay say \$3.50 for each 1,000 members. These payments make up the ordinary funds for the support of the Committee. There is a separate fund for the support of representatives in Parliament made up of an annual contribution of 2 cents for each M. P. paid by members of every affiliated society. This sum amounted in 1905 to about \$40,000. It is from this fund that the Committee will allow each of its elected members \$1,000 a year and 25 per cent. of his election expenses.

At the last election the Committee put forward fifty-one candidates of whom twenty-nine were elected. Of this number seven represent the Independent Labor Party (Socialists) and the rest various trades unions which have put their nominees in the hands of the Committee. It is clear, therefore, as *The Times* remarks, that the financial as well as the electoral strength of the movement rests upon the trades unions rather than upon the Socialists.

The parliamentary strength and composition of the Labor party are yet indeterminate. They will depend to a great extent on future events, and will probably vary with circumstances. Only twenty-nine of the members are bound together, and on some votes this may be all of their strength. On others it may be so much as sixty by the inclusion of all possible Labor members and some young Radicals who are not bound to the Government. Upon questions which immediately concern the trades unions the party front will be most united. There seems so far no definite platform, or programme. Amendments to the Workmen's Compensation Act so that compensation shall be payable from the date of an injury and, in the case of young people, that the amount of damage for an injury shall be reckoned on prospective not past earnings;

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the inclusion of all workmen; the restriction of insurance companies from procuring the discharge of old or feeble workmen and a guarantee against the employer's bankruptcy—all these have been asked for. As *The Times* sharply remarks, in discussing these proposals, it is highly problematical how these charges will commend themselves to the numerous employers who grace the Liberal benches.

Another matter of vital interest to trades unions occupying a prominent place on the Labor party's programme, is the necessity for some legal definition of the position of trades unions since the Taff Vale decision. This declared that the unions as corporations are liable for damages inflicted by strikes which they have ordered. The unions maintain that their funds are benevolent only, and cannot be sequestered for damages.

Other matters discussed by members of the new party are measures for dealing with

the unemployed, and, if the next winter brings forth an army of distress such as preyed upon London during that just passed the President of the Local Government Board, the Rt. Hon. John Burns will not have an enviable time at the hands of his former associates. Another Socialistic measure, the feeding of children in the public schools has already been discussed in the present Parliament without a decision. Some of the more advanced Laborites demand not only food but clothes for the public school children. There are many other measures in the background, like old age pensions and very large measures of electoral reform and remission of taxation, which so far have never come nearer to actualities than inclusion in some Labor programmes.

The Labor party in England is now a living growth, full of strength and vital promise. But the fruits of its labors are not even in the bud.

A NEW ISTHMIAN RAILROAD

MEXICO COMPLETING THE TEHUANTEPEC ROUTE THAT WILL BRING NEW YORK 1200 MILES BY SEA NEARER SAN FRANCISCO THAN THE PANAMA ROUTE—THE STORY OF ITS BUILDING—A LINK IN A GREAT INTERNATIONAL SYSTEM

BY

EDWARD M. CONLEY

MEXICO is about to take a twelve-hundred-mile "kink" out of the line of international commerce which has been using the Panama route. At the same time it will give the American trans-continental railroads a tremendous shock by opening a new short route from the Atlantic to the Pacific which they cannot control. By the end of the year the new railroad across the Isthmus of Tehuantepec is to be opened to interoceanic traffic on a large scale. The railroad has been completed for some time and is in operation for local traffic. It is only awaiting the completion of its terminal ports to begin handling ocean freight. These ports, though they will not be fully completed in less than two or three years, will soon be sufficiently advanced to be used by vessels of any size.

The railroad, being 600 miles north of the Panama railroad, is that distance nearer the natural line of the world's east and west commerce. It will bring New York and North Atlantic ports 1200 miles, and New Orleans and Gulf ports 1400 miles, nearer to San Francisco, Japan and China. The sailing time from New York to Coatzacoalcas, the Atlantic terminal port, will be six or seven days, two days less than to Colon, the Atlantic port of the Panama railroad. Cargo from a vessel landing at Coatzacoalcas, say of 10,000 tons, can be aboard another vessel in the harbor of Salina Cruz, in four or five days. In an emergency the trans-shipment could be accomplished in thirty-six hours. The same freight could not be transferred across the Isthmus of Panama in less than three weeks, possibly longer. At Salina Cruz,

the Pacific port, the vessel is two days nearer San Francisco than it would be at Panama. This serves to illustrate what the new route means in saving time.

But perhaps the more important fact is that the Tehuantepec railroad is able to handle ocean freight at all. Can the Panama Railroad? Under its old management American transcontinental railroads controlled it and rendered it valueless as a competing line. That is now changed, but without radical

There will be no discrimination. All shippers will be treated exactly alike. The rate question was settled in Mexico long ago. The Mexican government fixes all railroad rates and, strange as it may seem to American shippers, the law is obeyed.

The building of such a railroad was unsuccessfully attempted a great many times during the past half-century, mostly by Americans. The Tehuantepec route has been much discussed in the United States in connection



THE RAILROADS OF MEXICO, SHOWING THE NEW TEHUANTEPEC TRANS-ISTHMIAN LINE

improvements the Panama railroad could not possibly handle all the traffic that would naturally go to it. During the construction of the Canal the handling of general freight across the Isthmus of Panama will be limited and uncertain at best. The Tehuantepec railroad has been completed just in time to relieve the situation. It will be able at all times to handle all the business that comes to it without delay. It will be operated independently and upon a strictly business basis by a man who knows how to run it.

with the Panama and Nicaragua routes. About the middle of the last century it was proposed that the United States build a railroad across the Isthmus of Tehuantepec for international use, assuming control over and guaranteeing the neutrality of a strip of land on either side of it. Mexico was willing, but two treaties failed to obtain the approval of the American Senate and the matter was dropped. In the 70's a commission was appointed by our Government to report upon the feasibility of an interoceanic canal across

the Isthmus, and the Tehuantepec route had strong support in Congress. Some time prior to that an attempt was made to interest the Government in a scheme to build a "ship-railroad" across the Isthmus, which would carry vessels bodily on huge platforms resting upon parallel tracks across the narrow neck of land. More than a score of attempts were made by American companies and individuals to build a railroad as a private enterprise, under concessions from the Mexican government.

The road has finally been built by Sir Weetman Pearson, the English contractor, at the expense of the Mexican government. It is to be operated by the contractor in partnership with the Government for a long term of years. Its total cost, including the harbor and port improvements at its terminals, which constitute the chief items, will be nearly \$25,000,000.

The road is 190 miles long, following the only break in the great mountain range that extends through North, Central, and South America, and the route is, therefore, comparatively level. The chief difficulty in building a railroad in the tropics is to construct it so that it will withstand the torrential rains. The Tehuantepec railroad is most substantially built, with rock-ballasted road-bed, heavy creosoted ties, heavy rails, and heavy steel bridges, with unusually heavy masonry supports. Yet even with these precautions some sections of the track have been washed out a great many times. Experience and experiment have finally enabled the builders to overcome this difficulty sufficiently so that no interruption of traffic is likely to occur after the road begins handling trans-isthmian freight. The railroad is amply equipped with first-class rolling stock to handle a great volume of traffic without delay.

The building of a harbor at Salina Cruz the Pacific terminal was a difficult and costly undertaking. There was only an open roadstead and it was necessary to make an artificial double harbor. The outer harbor is being formed by two breakwaters thrown out like giant arms into the sea and enclosing, save for the entrance, a large area of water. The inner harbor will be a great excavated basin around which will be built the custom house, government stores, warehouses, and terminal tracks. At one corner of the basin will be a large dry-dock. Every modern facility

will be provided for the handling of freight from vessel to cars and vice versa.

The river at Coatzacoalcos, the Gulf terminal, forms a splendid inner harbor of unlimited capacity. It was necessary to remove a bar at its entrance; so two converging jetties are being built seaward from the mouth of the river, so as to scour out a channel by the action of the river current. The jetties are nearly a mile long. Docks and warehouses, machinery and appliances for handling freight, and railroad terminal facilities are being provided on a large scale.

The railroad will not have to wait for business when it is ready to handle it. Contracts have already been made with several large shippers to carry their freight across the Isthmus at the earliest possible date. From the day the terminal ports are ready to receive vessels, the road will handle more traffic than is now being handled by the Panama railroad. Arrangements have been made with a number of steamship lines for regular service between Pacific ports and Salina Cruz, and between Coatzacoalcos and North Atlantic ports.

The recently completed Vera Cruz and Pacific railroad, now owned by the Mexican government, connects the Tehuantepec railroad with the City of Mexico and with Vera Cruz, the country's chief seaport. From San Geronimo, on the Tehuantepec road, the Pan-American railroad is being built southward along the Pacific coast toward the Guatemalan border. About 150 miles of it are now in operation and it is hoped to connect it with the railway system of Guatemala within a year. The Pan-American will be a long link in connecting the railroads of North and South America.

Railroads of as great importance to Mexico, and incidentally to us, as the Tehuantepec road are being built in other parts of Mexico. Two lines, the Mexican Central and the Kansas City, Mexico, and Orient, are pushing through the rugged mountains of western Mexico to the Pacific coast. Other lines to western ports are projected. This section of Mexico, which is exceedingly rich in natural resources, has hitherto been isolated. Transportation facilities will bring about its speedy development. They will also mark the beginning of a new epoch in the commerce of the Pacific. Western and Central Mexico and the Middle West of the United States will send their products by these new railroads through

Mexican Pacific coast ports to the Orient and other markets of the world. Mexico is already a customer of the Far East to a limited extent and with rail communication between the Pacific coast and the interior of the country that trade will grow. The coastwise trade of the Pacific side of the Americas will be increased considerably. In effect, over 2,000 miles of new coast line, with half a dozen important ports, are about to be added to the commercial map of the Pacific.

Sixty-seven miles of track will connect the Guadalajara branch of the Mexican Central Railroad with the Pacific coast port of Manzanillo. The road is completed as far as Tuxpan and a line extends inland from Manzanillo to Colima. The descent from Tuxpan to Colima is through exceedingly rough mountains and the road between these two points will be a succession of tunnels, bridges, and cuts through solid rock. It is expected that it will be finished in less than two years. The Mexican government is making extensive harbor and port improvements at Manzanillo in anticipation of its completion. Manzanillo is due west of the city of Mexico. It is 600 miles distant by rail and will be the natural Pacific port for the capital. It is about 200 miles distant from Guadalajara, the second largest city in the republic, and will give that city an outlet which will be of inestimable advantage to it. The Guadalajara-Manzanillo branch of the Mexican Central and the Tampico branch of the same road will make an almost direct transcontinental line, less than 1,000 miles in length, from Tampico to Manzanillo. This road has a branch running southward from the City of Mexico to the Balsas river, which it expects to complete to the Pacific port of Acapulco as soon as it finishes its Manzanillo extension.

The Kansas City, Mexico and Orient railroad is building a direct line from Kansas City to Topolobampo, just at the end of the Bay of Lower California. Work is progressing simultaneously on different sections of this line. Some parts of it are already in operation. It will be finished very soon after the completion of the Mexican Central's line to Manzanillo. This road will be of the greatest advantage to our Middle West. It will give Kansas City an outlet to the Pacific nearly 700 miles shorter than the present route to San Francisco. That is the distance from Kansas City to Topolobampo by this

new line is only a little more than half the distance by rail to San Francisco. But more important than this is the fact that it will give Kansas City and all the territory tributary to it a competing line that will compete. It will remove the Middle West from the power of American transcontinental lines and enable it to build up a trade with the Orient and with the west coast of North and South America. One of the commissions appointed by the American Government to report upon an isthmian canal gave as its opinion that just such a railroad as this would be of more value to the United States than an interoceanic canal.

The Southern Pacific railroad, which has a branch from its main line through Nogales to Guaymas, on the Bay of Lower California, has recently obtained a concession from the Mexican Government to extend its line southward along the coast, through the States of Sonora and Sinaloa, to the port of Mazatlan and thence to Guadalajara. The Mexican International, which is now one of the national lines of Mexico, controlled by the Government, holds a concession for a line from Durango to Mazatlan. And there are other lines making in all an addition of 2,000 miles to the Mexican system of communication.

A glance at the accompanying map will show that all these 2000 miles of new railroads will not only open up new sections of country to development and new avenues for commerce; they will join Mexico's 10,000 miles of separate railways into a system. They will not only connect the capital of the country with every section of it; they will give each important city of the republic fairly direct connection with every other important city. They will perform the same service for border points, effecting a great saving of time and distance between American and Mexican cities. Within the next five years Mexico will have a network of railroads, that, with the same amount of mileage, could hardly be improved upon. They will have cost in the neighborhood of \$1,000,000,000 of which nearly \$400,000,000 will be American capital. American interests will own more than half of them; nearly \$400,000,000 will have been spent by the Mexican Government, in subventions, purchase price and cost of construction; and nearly \$200,000,000 of native and other capital than American will have been invested.

NATHANIEL SOUTHGATE SHALER

BY

LANGDON WARNER

THERE recently died in Cambridge, Massachusetts, much to the saddening of Harvard University and of an uncommonly wide circle, a man whose personality will always stand out strong in the lives of those that had the good fortune to know him—an unforgettable, many-sided, inspiring man, Professor Nathaniel Southgate Shaler, Dean of the Lawrence Scientific School of Harvard University.

His father was a Harvard man of the class of 1827 who settled, as a physician, first in Jamaica, whither the family had come from England; but he soon afterward went to Kentucky where his son was born in 1841, on a plantation outside the town of Newport. Here he lived until he was eighteen, attending for a little while the nearby school, but for the most part learning from his old tutor, the German scientist, Escher. He himself told how, when young, he was much alone, roaming the countryside with a dog and a musket. Often a little negro of his own age would go with him to carry the powder-flask and bullet-bag. With Herr Escher he read every book that his father's library afforded, German and English. He studied the classics and discussed philosophy with his tutor, who helped him to classify the collections of rocks, fossils, birds' eggs, and flora, which he brought home from the tramps and riding trips that took him over four counties and sometimes across the state border.

When he was eighteen, in the year 1859, he was sent to Harvard where he enrolled in the Lawrence Scientific School, and studied biology and other natural sciences under Professor Agassiz. With his degree in 1862, he hurried to Kentucky before Commencement Day to take a captain's commission in a light battery, the Fifth Kentucky of the Union Army. This soon came to be known as "Shaler's Battery" and gave a good account of itself through two years of active service. Some of us, his pupils, would give much to have seen the young Captain heading his battery against Bragg, or helping to cut

off Morgan when he tried to cross over into Ohio. We know that he was a good officer and no slack disciplinarian, but it is safe to say that some of his manœuvres were not to be found in the tactical treatises. On one occasion at least, he chose to regard his guns as a troop of horse, and used them as such against a dumbfounded enemy.

In 1864 Captain Shaler's health broke down from repeated attacks of camp-fever and from exposure. His usefulness in the army had come to an end. He resigned his commission and went back to Cambridge as instructor in Paleontology. Five years later when he was twenty-eight years old he was appointed a full professor.

As we of his later classes knew the Dean, he was tall and lank, with white hair standing stiffly erect from his high forehead. As the chapel bell started in the morning, his door would burst open and he would swing down the path, across a forbidden border of grass, and into the side door of the chapel. Here he sat erect under the preacher's right hand till the short service was over. At the benediction, he about-faced, turned into the main aisle and marched, with his black felt hat grasped to his breast, military fashion, out into the sun.

Man was to him the most delightful of all studies. Perhaps it should be said that he was a psychologist before he was a geologist. All science was written for him in terms of humanity, and no theory was too abstract, no law of nature too formal for him to make it instantly human. He had the great quality of being as old or as young as his companions, whether they were children, or boys, or men.

When Darwin first propounded the theory of evolution, he eagerly grasped the truth, and championed it even against the teachings of his master Agassiz, whom he greatly revered. A young man of the new school of scientists sought to trick him into an inconsistency, and pointed out that evolution must unsettle the beliefs of a man who accepted Christianity. Professor Shaler turned on him and said:

There is one aspect of railroad accidents that is very surprising, and which should be stated as a *per contra*. When we take into account the immense number of persons who travel by railroad, it turns out that, when we come to balance the accidents on railways, with those happening to an equal number of persons by the old methods of transport, the advantage is entirely on the side of railroads. Thus, in the French post system, there occurred in the period from 1846 to 1856, accidents causing 20 deaths and 238 wounded for 7,109,276 passengers carried, giving one to every 355,463—that is, nearly seven times as many deaths as occur in an equal number by railroad, even according to the reckless American system. According to Dr. Lardner's computations, 366,036,923 passengers must travel one mile to cause the death of one railroad employee. The chances of a person's meeting bodily injury in traveling one mile of railroad, are 8,512,486 to one. And the chances of one's meeting with a fatal accident in traveling one mile of railroad, are more than sixty-five million to one! What a consolation for a cracked cranium or a fractured femur!

COST AND MANAGEMENT OF ENGLISH AND AMERICAN RAILROADS.

A comparison of the reports, and an examination into the details, of the management of railways in this country and in Europe, disclose the following comparisons :—

Annual expense of American railways.....	\$120,000,000
“ “ English railways, same mileage.....	80,000,000
Annual difference.....	\$40,000,000
Average annual expense for maintenance of way of American lines..	\$33,000,000
“ “ of English lines, same mileage	12,500,000
Annual difference.....	\$20,500,000
Average annual cost of fuel for American lines	\$18,000,000
“ “ “ English lines, same mileage.....	7,500,000
Annual difference	\$10,500,000
Total annual expenses of American railways	\$171,000,000
“ “ English “	100,000,000
Total annual difference.....	\$71,000,000

In regard to the net results and financial profits of administration, the contrast between the two systems is remarkable :—

	Receipts per mile run.	Expenses per mile run.	Percentage of expenses on receipts.
England, (1856)	\$1 44	80 63 $\frac{3}{4}$	44
France, (1855).....	2 03	0 87 $\frac{1}{2}$	43
New York, (1855)	1 76	1 00	57
Massachusetts, (1855).....	1 69	1 05	62
“ (1856).....	1 83	1 08	59

The expenses for “maintenance of way, engines, and working,” are thus stated :—

	Per cent of total expenses.	Per cent of gross receipts.
New York railroads	70 $\frac{1}{2}$	40.1
Western “	80	43.8
English railways, (1856).....	57	25.3
French “ (1855).....	48	20.7

Some of the expenses of American railways are necessarily higher than those of the English. We must pay more for fuel; still more disproportionately for labor and service, the wages of day laborers here being at least double that in England. The price of land, however, is greater there. The road-beds in the Northern States are annually upheaved by frost, and the snows of winter, alternating with the extreme heats of summer, affect the wooden substructures. Our extraordinary freshets in the spring inflict immense damage upon the roads. The cost of engines and cars is greater; and the mechanical repair of both is made at a greater price.

Our roads are not unfrequently built through fresh-broken wildernesses; and, it must not be forgotten, are constructed and maintained, less with an idea to their profitableness, as investments, than for the incidental advantages they confer on the neighboring country and the terminal cities and villages.

CUBAN RAILROADS.

The Bay of Havana and Matanzas Railway was recently opened with great ceremony to Guanabaco. His Excellency, the Captain-General, and suite were present, and also the Right Rev., the Bishop of the Diocese. As on all public occasion in Cuba, there was a great display of the military. The steam ferry-boats connected with the line, which ply from this city to Regla, were gaily decorated with flags and streamers, as was also the railroad depot at Regla—nor could I avoid observing the stars and stripes floating nobly among the rest from the pretty ship *Riga*, of Marblehead, which was at her berth alongside the company's wharf.

On the 17th August, His Excellency, the Captain-General, accompanied by General Manzano, Segundo Cabo, Brigadiers Echavarria, the political Governor of this city, the Director of Public Works, Don Domingo, and Don Miguel Aldumer, and several other gentlemen, embarked in a special train of the Havana and Gaines Railway to inspect a new iron bridge that has been erected for the purpose of the railway over the River Almendares. The bridge is upwards of seventy feet in length, and is a light and elegant yet strong structure.

The new railroad depot, for the railway now building between Regla and Matanzas, is an elegant gothic building, nearly 300 feet in length, and about 60 feet in breadth. The painted doors and windows are all of solid mahogany. These two new splendid locomotives, called "the Marquis de la Habana" and "Jacinto G. Laninaga," were built at Patterson, New Jersey, and each weighs eighteen tons. There is a third locomotive, the "Edward Fesser," built at Philadelphia, employed on the line. The first-class passenger cars, are possessed of admirable ventilation and general comfort and elegance. The cars were built in Jersey City. The rails possess uncommon strength, weighing no less than 68 pounds to the yard. This railway will prove of immense public benefit; at present, six or seven hours are occupied in going by a circuitous route, change of cars, &c., to Matanzas. By the new line, which is direct to Matanzas, a man will be able to take an early train and be in Matanzas in good time for breakfast, remain there through the day, and return to this city in the evening.

Soc. of Engineers - France
1868

February 3rd, 1868.

BALDWIN LATHAM, PRESIDENT, IN THE CHAIR.

THE PANAMA RAILROAD.

BY DR. CULLEN.

As the Panama Railroad Company's contract or charter was based upon some previous privileges or concessions that had lapsed from non-fulfilment of their conditions, a notice of them will serve to introduce it.

1836, May 29. A privilege for a canal across the Isthmus of Panama was granted to Matthew Klein, as representative of the Franco-Grenadian Company, of which M. Salomons, of Martinique and Paris, was the promoter. On the 6th of June, some modifications of the same were passed by the Congress of New Granada.*

1839, May 30. A renewal of the above was granted to M. Alphonse Morel, the representative of the Franco-Grenadian Company. Although these privileges became null and void, the concessionaires induced Louis Philippe and Guizot to send out M. Napoleon Garella and M. de Courtines, by whom a detailed and admirable survey was made in 1843 and 1844. M. Morel, whom the author had the pleasure of meeting at Panama, had previously made a minute examination of the ground, and found a very low summit level. His assertion was, however, always doubted until very lately, when it was found that there is, not far from the summit of the railroad line, a summit level of only a few feet greater elevation than that which he had assigned to it. Count de Secqueville, who had been one of the directors of the company, assured the author, in Paris, that Guizot entered into the project of a canal with enthusiasm.

1847. A contract for a railroad was concluded at Bogotá between Juan de Francisco Martin and Matthew Klein. The former was specially authorised by the executive power; the

* "Recopilacion Granadina," Bogotá, Imprenta del Gobierno, 1845.

latter was agent of the Panama Company of Paris. The following were the directors of the company: M. Jean Louis Marie Eugene Durien, chief of a section in the Department of the Interior; Viscount François Ernest Chabrol de Chameane; Jean Edouard Caillard, Administrator of the Messageries Générales; Lieutenant-Colonel Alexandre de Bellegarde, Jacques Courtines, civil engineer; François Thierry Chevalier; Ch. Veyret; Eloi Dumont; Silvaine Jacques Joseph Joly Blazon de Sabla; Augustin Jean Salomons; Baron Jean Henri Joseph de Lagos; William Henry Bainbridge, banker; and Sir J. Campbell, vice-president of the Oriental Steam Company. June 6. The above contract was approved by a decree of Congress. June 8. It was signed by T. Cipriano de Mosquera, then President, and M. M. Mallarino, the Secretary for Foreign Relations and Internal Improvements.

The Panama Company, of Paris, having failed to make the pecuniary deposit required as a guarantee for the completion of the works, the above grant, by its terms, became forfeited, and was transferred to the Panama Railroad Company. Klein's concession was for ninety-nine years.

1848, December 28. A contract was concluded, in Washington, between General Pedro Alcantara Herran, Minister of the Republic of New Granada, and William Henry Aspinwall, John Lloyd Stephens, and Henry Chauncey, of New York, conceding to the latter parties a privilege for constructing a railroad (camino de hierro) across the Isthmus of Panama, and a grant of all necessary lands, with 250,000 acres in addition.*

1849, June 12. The executive power was authorised by a legislative decree of the Congress of New Granada to amplify and modify the above.

1850. By virtue of the above authority, a new contract was concluded between Victoriano de D. Paredes, the Secretary for Foreign Affairs, and J. Lloyd Stephens,† vice-president of the Panama Railroad Company, on the 16th of April, approved by Congress on the 29th of May, and signed by José Hilario Lopez, the President, and Paredes, at Bogotá, on the 4th of June.‡

* King's Railroad across the Isthmus of Panama. Report 26, 2nd Session, 30th Congress, U.S., Jan. 16, 1849.

† Having arrived in Panama from Darien in February, 1850, just before Mr. Stephens sailed in the Pacific steamer for Buenaventura *en route* for Bogotá, to apply for this contract, the author had the pleasure of taking leave of him on his departure. Being unable to proceed to Bogotá himself at that time, he forwarded, through General Daniel Florence O'Leary, then British Chargé d'Affaires at Bogotá, petitions to Congress for a privilege for a canal from Caledonia Bay to the river Savana, and for authority to introduce foreign labourers and miners into the republic.

‡ Panama Railroad Contract, Lambert and Lane, 69, Wall-street, New York.

"Among the concessions by the terms of this contract was one guaranteeing that all public lands lying on the line of road were to be used gratuitously by the company; also a gift of 250,000 acres of land to be selected by the grantees from any public lands on the Isthmus. Two ports—one on the Atlantic and the other on the Pacific—were to be *free* ports; and the privilege was granted of establishing such tolls as the company might think proper. The contract was to continue in force for forty-nine years, subject to the right of New Granada to take possession of the road, at the expiration of twenty years after its completion, on payment of five millions of dollars; at the expiration of thirty years on payment of four millions; and at the expiration of forty years on payment of two millions.* Three per cent. was to be paid to the New Granada Government upon all dividends declared. The entire work was to be completed within eight years, and a sum of 120,000 dollars was to be deposited at its commencement as security for the fulfilment of the contract, but to be refunded, with interest, on the completion of the road within the given time."†

A charter was then granted by the Legislature of the State of New York for the formation of a stock company, under which one million dollars of stock were taken—the original grantees having previously transferred their contract into the hands of this Company.

Early in 1849, Colonel Hughes, of the United States' Topographical Engineers, was sent to survey the line, and another summit gap was discovered by Mr. Baldwin, 37 ft. lower than that previously established by him.

Early in the same year, 1849, a contract was entered into with G. M. Totten and J. C. Trautwine, who had a short time before been engaged upon the Dique Canal connecting the Magdalena River with the Caribbean Sea at Carthagená. Soon after, at their own request, they were released from their obligations as contractors, and retained as engineers, the company having determined to take charge of the construction themselves.

The character of the country through which the line for the road had been carried was such as might well have made the

* This charter was, however, renewed for 500 years, from 1875, by the President, on the 5th of July, 1867; and, it is said, the renewal was approved of by Congress on the 16th of August, 1867, by a majority of one. In consideration of this extension of their lease, the company paid 200,000% in gold, and engaged to pay the Government of Colombia 50,000% per annum, and to run the pier at Panama so far out into the bay that ships of the greatest draught of water may lie alongside it.

† Otis, F. N., Esq., M.D. "Panama Railroad Illustrated." Sampson Low, 1862. This very interesting book contains a great number of views, and a large fund of accurate information.

hardest projectors shrink from attempting its construction. The first thirteen miles, beginning at Navy Bay, led through the Mindi Swamp—a deep morass, covered with the densest jungle, reeking with malaria, and abounding with almost every species of wild beasts, noxious reptiles, and venomous insects known in the tropics. For the first $8\frac{1}{2}$ of these 13 miles the swamp was so deep that it had to be piled and then filled in with earth. Farther on, though some of the land was so fair and beautiful that the natives called it *Paraiso*, the greater part of the line was through a rugged, broken country, along steep hill-sides, over wild chasms and deep ravines, spanning turbulent rivers and furious mountain torrents, until the summit ridge was surmounted, when it descended abruptly to the shores of the Pacific.

In May, 1850, they commenced clearing part of the island of Manzanillo,* which is 7000 ft. in extreme length, and 5800 in extreme width, and has an area of 650 acres, or little more than one square mile. It derives its name from the great number of manchineel trees (*Hippomane mancinella*, Euphorbiaceæ) which grow on it. In clearing a way for the railroad, some of the labourers suffered severely from conjunctivitis, and were nearly blind for a day, in consequence of the juice of one of those trees getting into their eyes. The island is separated from the mainland by a frith 700 ft. in width, and 10 ft. in its greatest depth. This frith was afterwards crossed by a causeway, built of piles and cribwork, which were soon replaced by stone and earth.

Manzanillo was then a virgin swamp, covered with an impenetrable thicket of mangroves, and interlaced with immense vines and thorny shrubs. In the black slimy mud of its surface alligators and other reptiles abounded, while the air was laden with pestilential vapours and swarming with sand-flies and mosquitoes. Residence on the island was impossible, so that the party took up their quarters in an old brig until part of it was cleared. In July, Mr. Trautwine arrived with several assistant engineers and a surgeon, Dr. Totten, brother of the Colonel. Soon afterwards about fifty Irishmen arrived from New Orleans, to reinforce the handful of men that had commenced the work. On the 1st of October, 1861, a train of cars, drawn by a locomotive, passed over the road as far as Gatun. In the following month two large steam-ships, the *Georgia* and *Philadelphia*, with passengers from the United States, *en route* for California, put into Navy Bay, from whence the passengers were conveyed on the railroad to Gatun.

On the 2nd of February, 1852, the settlement at Navy Bay

* Manzanillo Island was ceded in perpetuity to the Panama Railroad Company by the Congress of New Granada, in 1852.

was formally inaugurated as a city by Don Victoriano Paredes, and named Aspinwall by the Americans, and Colón (Columbus) by the Granadians. By March the road was completed to a station on the Chagres, called Bohío Soldado, 8 miles beyond Gatun, and passenger trains ran in connexion with every steamer. By the 6th of July it was pushed on to Barbacoas,* where its course was intersected by the Chagres river, making a total distance from Aspinwall of 23 miles. At this time an agreement was entered into with Mr. Story to complete the work. The death of the lamented president of the company, Mr. J. L. Stephens, also took place at this time.

At Barbacoas the Chagres is about 300 ft. in width, flowing through a deep and rocky channel, and subject to sudden freshets, often rising 40 ft. in a single night; so that, when the bridge was nearly completed, one span of it was swept away, causing much delay and expense. By January, 1854, the summit ridge was reached, distant from the Atlantic terminus $37\frac{3}{8}$ miles, and $10\frac{1}{8}$ miles from Panama. Simultaneously with the operations towards the Pacific the road was pushed, under the superintendence of Mr. Young, from Panama over the plains of Panama, through the swamps of Corrisal and Correndeu, and up the valley of the Rio Grande, to meet the advancing work from the Atlantic side; and on the 27th of January, 1855, at midnight, in darkness and rain, the last rail was laid, and on the following day a locomotive passed from ocean to ocean.

The entire length of the road was 47 miles 3020 ft., with a maximum grade of 60 ft. to the mile. The summit grade was $258\frac{6}{10}$ ft. above the assumed grade at the Atlantic, and $242\frac{7}{10}$ ft. above the assumed grade at the Pacific terminus, being $263\frac{9}{10}$ ft. above the mean tide of the Atlantic, and the summit ridge 287 ft. above the same level.

A pier, 450 ft. long, was constructed in the Bay of Panama, to the end of which freight cars were run to receive cargoes from lighters, or vessels lying alongside, and deliver the same on board vessels at Aspinwall. The lighters, which used to load and discharge vessels whose draught of water prevented them coming to the pier, were soon superseded by the Company's iron launches of 160 tons each. These launches are towed by a powerful steam-tug. The charge for lighterage is $1\frac{1}{2}$ dollar per ton. On the completion of the road, Taboga and three other islands in the bay, affording good anchorage, and well supplied with springs of water, were purchased by the Company. The line is single; but there is a double line of rails at Gatun, near

* Barbacoas signifies a sort of suspension-bridge made of bejucos, or bush-ropes.

Barbacoas, at Matachin, and the Summit. Wood is used for fuel.

Commencing at Aspinwall,* in lat. $9^{\circ} 21' 23''$ N. and long. $79^{\circ} 53' 52''$ W., the road skirts the island of Manzanillo for $\frac{3}{4}$ of a mile, crosses to the mainland, then follows the shores of Navy Bay, till it reaches the little river Mindee, from whence it continues to the Chagres, along the east bank of which it runs as far as Barbacoas. There it crosses the river by a wrought-iron bridge, 625 ft. in length, 18 broad, and 45 above the surface of the water. From the bridge it follows the left, or west, bank of the Chagres to the mouth of the Obispo,† and then follows the valley of this stream to its head in the summit ridge, $37\frac{3}{8}$ miles from the Atlantic, and $10\frac{1}{5}$ miles from the Pacific terminus. Passing the summit ridge, by a cut $\frac{1}{4}$ of a mile in length and 24 ft. in depth, it strikes the head-waters of the Rio Grande. Following the left bank of this stream, and descending by a grade of 60 ft. to the mile for four miles, the line crosses the rivers Pedro, Miguel, Caimitillo, and Cardenas, near their entrance into the Rio Grande. Thence it stretches across the savanas of the Corrisal and the swamps of Correnden, and cutting through a spur of Mount Ancon, reaches the Pacific at Playa Prieta, the northern suburb of Panama. The terminus there is in lat. $8^{\circ} 57' 20''$ N., long. $79^{\circ} 31' 40''$ W. It is, therefore, only 33 nautical, or $38\frac{1}{2}$ English, miles, S. 42° E., or S.E. $\frac{1}{4}$ S. of Aspinwall, although, as stated above, the length of the railroad is 47 miles 3020 ft.

DISTANCES AND LEVELS.

	Miles.	Feet above mid-tide of the Atlantic.
Aspinwall . . . . .	...	3·75
Monkey Hill	1 1200ft.	13·44
Mindi Plains	2 2—7	6·23
Gatun Station	6 590	18·11
Tiger Hill (a quarry here)	9 910	22·69
Lion Hill Station	10 3400	21·10
Ahorea Lagarto‡ (River Juan Gallegos)	12 4400	26·27
Bohio Soldado Station§ (Rio Agua Salud)	15 2000	40·05
Frijole (Rio Frijol Grande)	18 3200	36·24
Barbacoas|| Station	23 300	62·05

* See accompanying maps, Plates 1 and 2.

† The Obispo falls into the Chagres, near Matachin. It rises in a ravine among some small hills, called Los Hormigueros, or the Ant Hillocks, about eight miles from the Bay of Chorrera, ten miles S.W. of Panama.

‡ This place derives its name from having been pitched upon as an encampment by a body of troops, who suspended from a tree their banner, on which was a lizard, the insignia of the Order of St. Jago.

§ The soldier's hut. Bohio was the Caribsee name for a hut.

|| Cerro Gigante, from the summit of which both oceans are visible, is $5\frac{1}{2}$ miles S.W. of Barbacoas Station.

	Miles.	Feet above Mid-tide of the Atlantic.
Baila Monos	25	800 ft. 53
Mamey Station	26	3100 62·68
Gorgona	28	32007 6
Matachin	30	71·05
Obispo Station	31	75
Empire Station	35	4500 218
Summit (Cerro Culebra, between R. Grande and R. Obispo)	37	262·4
Paraiso Station	38	4500 137
Pedro Miguel Settlement	40	88
Bridge over R. Caimitillo, a branch of R. Grande	41	34
Rio Grande Station	43	17
Panama (Railroad Terminus at Playa Prieta)	47	3020 18·7

The geology of the line is given in detail by Dr. Wagner,* who was sent, in 1857, on a geological and botanical tour by the King of Bavaria. The results of his investigations are as follows:

	Formation.
Aspinwall	Coralline.
Mindi	Tertiary Tufa† and Conglomerate.‡
Tiger Hill	Trachitic Tufa.§
Frijole	Trachitic Breccia.||
Gorgona	Dolerite¶ Porphyry.**
Obispo	Dolomite.††
Empire Station	Dolerite Tufa.

* Wagner, Moritz, M.D., Beitrage, in Petermann's "Mittheilungen." Gotha, 1861.

† Tufa is a name applied to several different substances, the product of volcanic eruptions; generally, it is an aggregate of sand, volcanic ashes, and fragments of scoria and lava, united by an argillaceous or muddy cement. It presents various shades of grey, brown, red, or yellow, and is sometimes spotted. Its hardness is moderate, and its fracture dull and earthy.

‡ Conglomerate, a mass of fragments united by some cement.

§ Trachyte is a kind of volcanic porphyry, usually containing crystals of glassy felspar, and exceedingly rough to the touch; hence its name, from *trachus*, rough. It sometimes possesses a columnar structure. It is generally of a coarse grain, and with a degree of porosity. From this latter circumstance it easily breaks down, and forms frequently a conglomerate with other substances.

|| Breccia is the name applied to any rock composed of angular fragments cemented together.

¶ Dolerite is a variety of trap rock, composed of augite and Labrador felspar. Augite is a mineral of a dark green, brown, or black colour, found in volcanic rocks. Its fracture is conchoidal and uneven. It generally crystallises in six or eight-sided prisms terminated by dihedral summits. It is attracted by the magnet, and scarcely fusible by the blow-pipe. With borax it melts into a yellowish glass, which, while hot, appears red. Augite consists of silica, 52; lime, 13; protoxide of iron and manganese, 16; magnesia, 10; and alumina, 9.

** Porphyry, any form of rock in which one or more minerals are scattered through an earthy or compact base.

†† Dolomite, or magnesian limestone, is composed of magnesia 48, and lime 52.

At Tiger Hill there is a stone quarry; a mile beyond Bohio Soldado is a quarry of free-stone alongside the track; and at San Pablo there is one of recent volcanic rock.

Beyond the summit the scenery becomes bold and picturesque in the highest degree. Lofty conical mountains, with deep ravines between them, and rocky spurs, rise on either side. About a mile on the Pacific side of the summit, the railroad passes along the side of a huge basaltic cliff, whose great crystals, nearly 1 foot in diameter and from 8 to 12 feet in length, lie at an angle of about 40 degrees.

The beholder cannot but be struck with admiring wonder, on contemplating this curious formation, at the regularity and beauty of its crystallisation, and with awe, when he reflects upon the gigantic internal forces that have resulted in its upheaval. It is one of the few known examples in the world where the natural perpendicular, which basaltic formations assume (so beautifully seen in Fingal's Cave at Staffa, and along the "Palisades" of the Hudson), has been so rent and displaced; but this whole region gives unmistakable evidence that great and comparatively recent volcanic forces have been instrumental in its formation. There is no continuity of the mountain ranges; conical peaks rise up on every side, perfect marine shells and coral are found on their very summits, and the strata of the rocks, exposed by the cuttings on the railroad line, are all volcanic.* On the left of the terminus rises Cerro de los Bucaneros, where Morgan encamped the night before he attacked Panama.

The mortality during the progress of the work has been greatly exaggerated. It was mainly due to the fact that the men were always in the wet while working in the swamps near the Atlantic coast: amongst those employed upon the high ground there was very little loss of life.

Mr. David Hoadley, President of the Panama Railroad Company, says:† "The first blow was struck in January, 1850. Since then a strict record has been kept of the deaths which have occurred among the white men employed by the company; and, up to the time of opening the road, on the 28th of January, 1855, the number was 293, of which many are known to have been caused by diseases not incidental to the climate. How many white men were connected with the work during the period cannot be accurately detailed; but the number was at least 6000. No record was kept of the mortality among other classes

* Otis, Dr. Op. cit.

† Communication of the Directors to the Stockholders of the Panama Railroad Company. New York, August, 1855.

of labourers; but the proportion was greater among coolies, and less among Jamaica men and natives."

Thus the mortality amongst the white men was only one per cent. for each of the five years. Owing to the terraqueous nature of the Atlantic portion of the line, the labourers were constantly in the wet, day and night, standing and lying. The prolonged suppression of perspiration caused by this unwholesome condition of existence, aided by the malarious or mephitic miasmata, evolved by the decomposing vegetable and animal matters in the swamp, gave rise to remittent fevers, which would not have been very fatal had there been any dry place for the patients; since, in the eight or nine cases that the author attended in Aspinwall, the fever yielded readily to treatment. The greatest mortality was amongst the Chinese, numbers of whom committed suicide, probably from nostalgia, or home sickness. Sometimes six or seven were found in a morning hung from trees along the line.

The town of Aspinwall or Colón was first settled in 1850 by the *employés* of the Company. On the completion of the line as far as Gatun, and the consequent abandonment of Chagres, it suddenly rose into importance as a receiving and transshipping depôt. It was formally inaugurated as a city on the 2nd of February, 1852, by Don Victoriano Paredes, the Foreign Secretary of New Granada. It derives its names from Aspinwall, of the firm of Howland and Aspinwall, the contractors, and from Columbus, who is called Colón by the Spaniards. It is situated on Manzanillo Island, on the east side of Navy Bay, in lat. $9^{\circ} 21' 23''$ N., long. $79^{\circ} 53' 52''$ W., and has a population of 2000. Its situation is low and swampy, and it has the most rainy climate of any part of the Isthmus. This might be improved by clearing away the bush on the island. Some wide and deep basins have been dug close to the town for the purpose of draining it.

A magnificent wharf extends out upon a coral reef, nearly 1000 feet, to where a depth of water exists sufficient to float the largest ships. It is 40 ft. wide, and covered by a lofty metallic roof: the piles upon which it stands are coppered to protect them from the *teredo navalis*. This wharf is a great convenience, as passengers, on landing, can at once take their seats in the cars for Panama, or, *vice versâ*, can step out of the train and embark directly on board a steamer. Close to it there is a fire-proof warehouse, 300 ft. long and 85 ft. wide. The houses, about 200 in number, are of wood, and built in a style midway between the New England house and the verandah structures usual in the tropics. The mess-room of the Company's officers, Colonel Totten's house, John-

son's ice-house, the American Hotel, and Aspinwall House are the principal buildings. Except those belonging to the Company, all the houses are built on land leased from it by private individuals. Manzanillo Island, being a low coral foundation, has no spring; water is, therefore, collected in large iron tanks, of which there are several. In the market green turtle is abundant, at five cents per lb. Aspinwall, though belonging to New Granada, has a separate civil government, the control of which is possessed chiefly by residents from the United States, most of whom are connected with the Company. A riot occurred here, on the 15th of April, 1856, between the Granadians and the Americans, and much property was destroyed, in consequence of which the latter presented claims at Bogotá for indemnification for losses to the amount of 1,200,000 dollars. These were settled by the Herran-Cass Treaty, signed at Washington on the 10th of September, 1857. The greatest rise of tide in Navy Bay is 1.60 ft.; at Panama it is 21.30 ft.

The construction account, closed in 1858, amounted to 8,000,000 of dollars, equivalent, at 4s. 6d. for the American dollar, to 1,800,000*l*. The cost of the line was, therefore, 37,894*l*. per mile.

Regular trains are despatched daily from Aspinwall to Panama, and from Panama to Aspinwall, calling at Gatun, Bohio, Barba-coas, Matachin, and the Summit Stations. The journey occupies four hours. Special trains are also employed whenever the service cannot be adequately performed by the regular trains. There are often as many as five or six daily, for weeks together. On the arrival of steamers at Aspinwall trains are despatched at any hour, so soon as the passengers are landed. On the arrival of a steamer at Panama, the trains start immediately on the landing of the passengers for Aspinwall, where they step from the cars into the steamers without any delay. The fare is 25 dollars, or 5*l*. 4s. 2d. The special rates of freight vary from a quarter of a cent to ten cents per lb. First-class freight is 50 cents per cubic foot, coal 5, and coke 7 dollars per ton of 2240 lbs. The freight on silver in bars is $\frac{3}{8}$, silver ore $\frac{1}{2}$, and gold $\frac{1}{4}$ per cent on value. The express freight by steamer trains is 1 dollar 80 cents per cubic foot.

Besides merchandise from Europe for the Pacific, the principal articles conveyed by this line are hides, india-rubber, cinchona bark, tobacco, orchilla, dye-woods, pearl shells, Panama hats, cigars, sperm oil, vegetable ivory, ceroons of indigo and cochineal from San Salvador and Guatemala, coffee from Costa Rica, cocoa from Ecuador, sarsaparilla from Nicaragua, copper ore from Bolivia, silver bars from Chili, boxes of dollars from Mexico, and gold ore from California.

Colonel Totten, the superintendent of the railroad, has lately published a statement of the work of the line from its opening, in January, 1855, to December, 1866. During this period of nearly twelve years, the number of passengers carried was 396,032.

The treasure transported exceeded	500,000,000	dollars in gold,
" " "	147,000,000	" in silver,
" " "	5,000,000	" in jewellery, and
" " "	19,000,000	" in paper money.

The tonnage of general merchandise exceeded 600,000,000, or upwards of 155,500,000*l*.

In 1856, the total income was	. . .	1,360,741	"
" " expenses	. . .	530,249	"
		<hr/>	
" " net proceeds	. . .	830,492	"
In 1866, the total income was	. . .	2,424,977	"
" " expenses	. . .	1,208,364	"
		<hr/>	
" " net proceeds	. . .	1,216,613	"

On the Atlantic side the lines of steamers communicating with the railroad are :

1. The Royal Mail Steam Packet Company's vessels, running every fortnight between Southampton, the West Indies, the East coast of South and Central America, and Aspinwall. The fleet consists of 23 large steamers, of which the *Tyne*, *Tamar*, *Solent*, and *Eider* run between St. Thomas and Aspinwall. A vessel leaves Southampton for Aspinwall on the 2nd and 17th of each month.

2. The West India and Pacific Steamship Company's vessels, which leave Liverpool for Aspinwall on the 10th and 25th of each month. The fleet of this Company consists of the *Granadian*, *West Indian*, *Caribbean*, *American*, *Californian*, *Chilian*, *Mexican*, *St. Thomas*, *Colombian*, *Cuban*, *Bolivar*, *Darien*, *Hayti*, *Crusader*, *Askalon*, *Barbadian*, *Talisman*, *Plantagenet*, *Albion*, and *Venezuelan*.

3. The Atlantic and Pacific Steamship Company's vessels, which leave New York (foot of Warren St., North River) at noon on the 1st, 8th, 16th, and 24th of each month, for Aspinwall. Fare, 40 dollars in the steerage and 70 dollars in the state-room. By arrangement with the Panama Railroad Company and the Pacific Mail Steamship Company, through passage tickets from New York to San Francisco are furnished for 200 dollars in the first cabin, 150 dollars in the second, and 100 dollars in the steerage, these fares including board. The passage from New York to Aspinwall is usually made in eight days.

4. A French line that has recently commenced running from

St. Nazaire to Aspinwall. Besides the steam lines, there are lines of sailing packets from Liverpool, New York, Bremen, Bordeaux, and St. Nazaire to Aspinwall. The two first belong to the Panama Railroad Company.

The communications between Panama and the Pacific ports are maintained by the following lines of steamers:

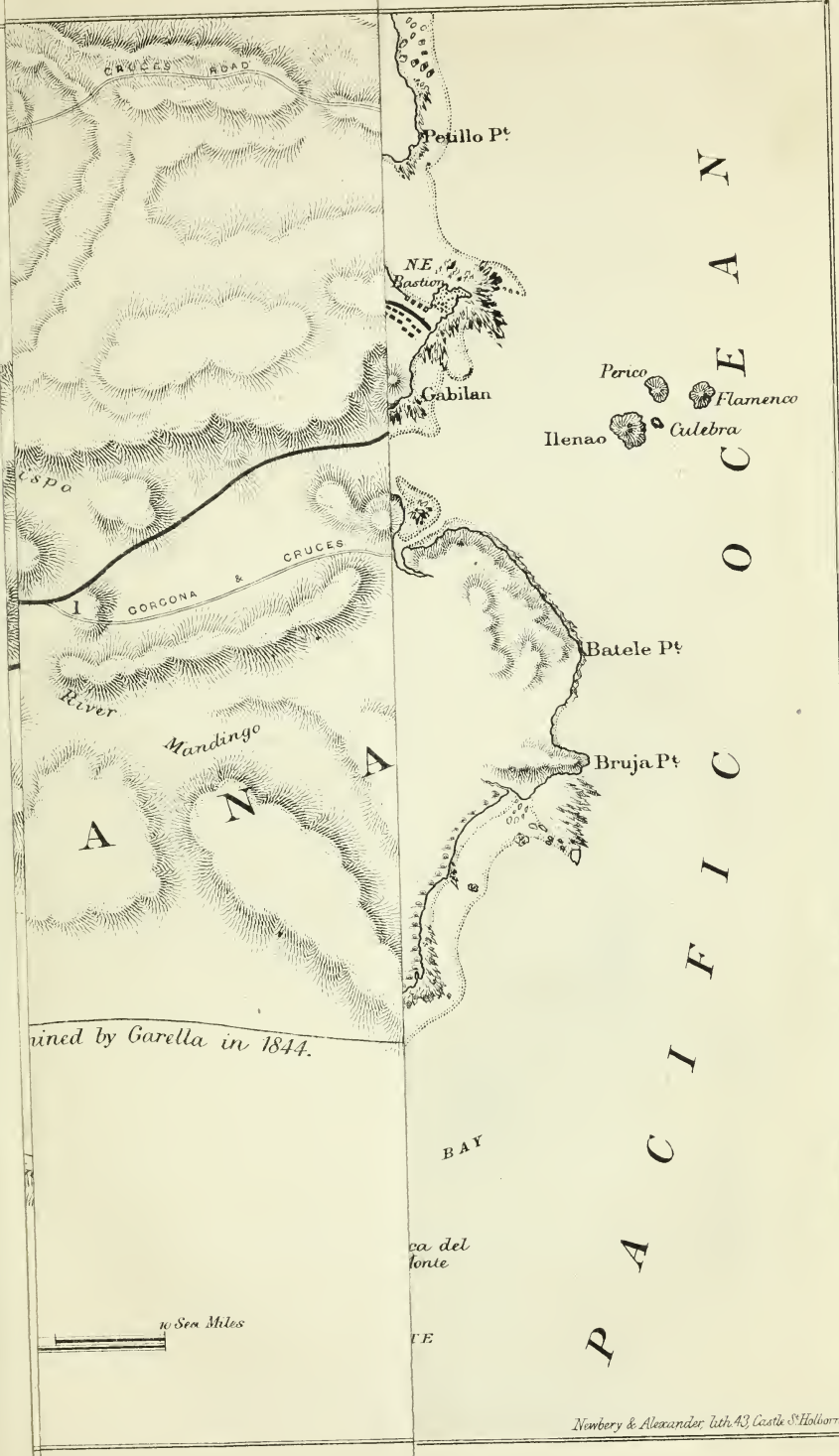
1. The Pacific Steam Navigation Company's vessels, plying every fortnight between Panama, and Buenaventura, and Tumaco, in New Granada; Esmeraldas, Manta, and Guayaquil, in Ecuador; Tumbes, Payta, Lambayeque, Pacasmayo, Malabrigo, Huanchaco, Santa, Samanco, Casma, Huarney, Supe, Huacho, Callao, Cerro Azul, Tambo de Mora, the Chincha Islands, Pisco, Chala, Quileca, Islay, Ilo, Arica, Mexillones, Pisagua, and Iquique, in Peru; Tocopilla and Cobija, in Bolivia; and Taltal, Chanaral, Caldera, Carrizal-bajo and Huasco, Coquimbo, Tongoy, Valparaiso, Tome, Talcahuano, Lota, Corral (Valdivia), Ancud, Calbuco, and Port Montt, in Chili. The steamers of this Company are the *Tulca*, *Ecuador*, *Bogotá*, *Lima*, *Callao*, *Valparaiso*, *Guayaquil*, *San Carlos*, *Bolivia*, *Anne*, *Cloda*, *New Granada*, *Inca*, *Morro*, and *Payta*.* A contract was concluded in 1846, between the British Government and this Company, for the conveyance of the mails on the West Coast of South America.

2. The Panama Railroad Company's Central American line of steamers, running every fortnight between Panama, Punta Arenas, Realejo, La Union, La Libertad, Acajutla, and San José de Guatemala.

3. The Pacific Mail Steamship Company's vessels, which run every week from Panama to San Francisco, California, touching at Manzanillo and Acapulco, in Mexico. The passage from Panama to San Francisco is generally made in from twelve to fifteen days. The vessels of this Company are the *Golden Age*, *Golden Gate*, *Sonora*, *St. Louis*, *Uncle Sam*, *Washington*, *Orizaba*, *Fremont*, *California*, *Constitution*, and two others.

4. The Imperial Mexican Company of packets in the Pacific, plying monthly between San Francisco, La Paz, Guaymas, and Mazatlan, and every fortnight between Mazatlan and Acapulco, touching at San Blas and Manzanillo. This and the Oregon line were established in 1861, by Holliday and Flint, of San Francisco, who purchased the steamers *Panama*, *Cortez*, *Republic*, *Columbia*, and *Sierra Nevada*, from the Pacific Steamship Com-

* The *Payta*, 1800 tons, arrived at Valparaiso in November, 1864, having made the voyage from Liverpool, deducting stoppages, in 31 days, 14 hours, and 59 minutes, although she had to contend with a head wind, a heavy sea, and an adverse current of 7 miles an hour in passing through the Straits of Magellan. The *Limena* made the run from Liverpool to Valparaiso in 38 days.



igned by Garella in 1844.

PANAMA RAILWAY

CENTRAL AMERICA.

ATLANTIC OCEAN

PACIFIC OCEAN

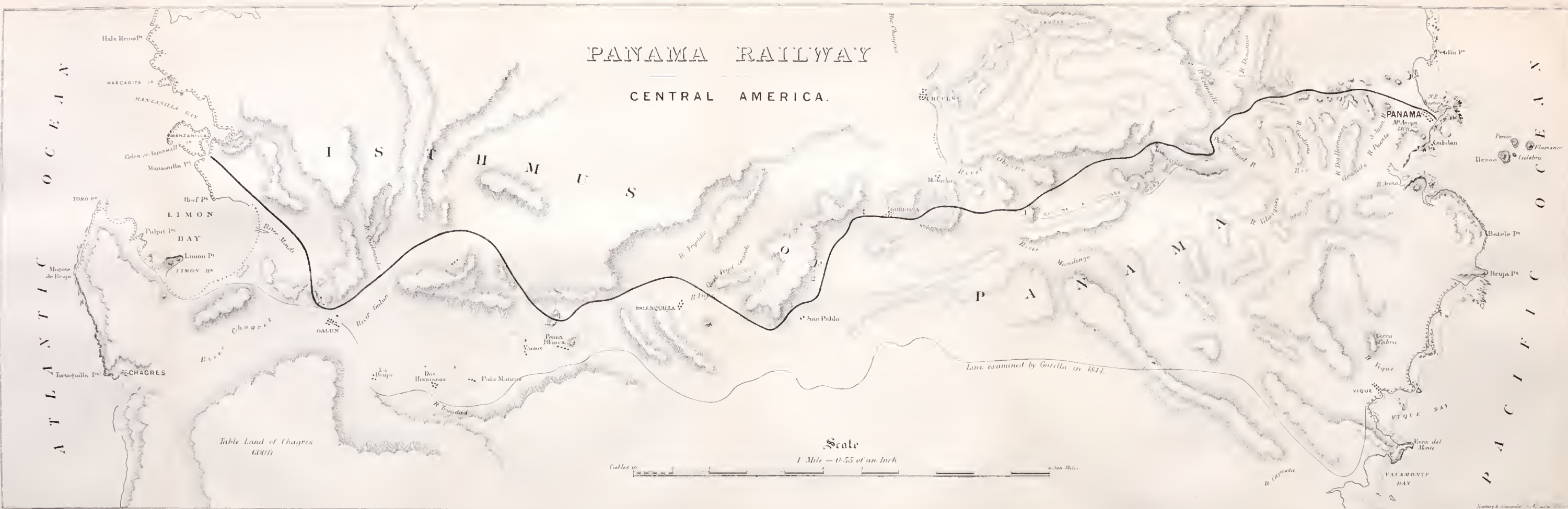
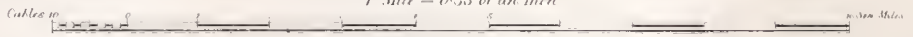


Table Land of Chagres
6000

Line examined by Gorella in 1844.

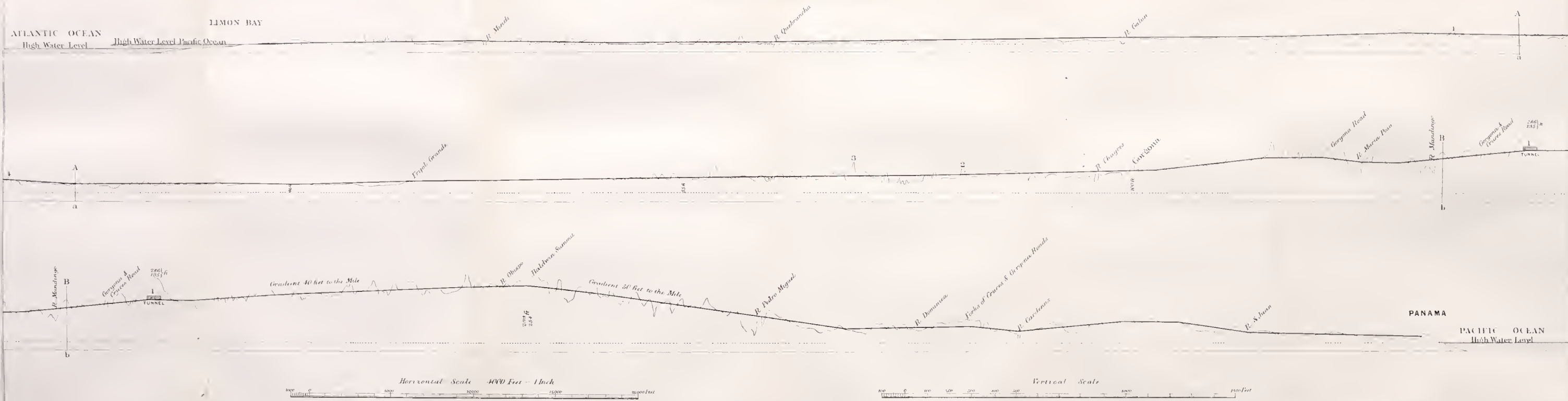
Scale

1 Mile = 0.55 of an inch



PANAMA RAILWAY. CENTRAL AMERICA.

SECTIONS.



pany, by whom those lines had been previously managed. On the 31st of January, 1865, Maximilian's Government agreed to pay an annual subsidy, for seven years from that date, of 70,000 dollars for the main, and 25,000 dollars for the branch line, the former to be under the United States' flag, the latter under the Mexican.

5. The Oregon and California Steamship Company's five vessels, plying between California and Eureka (Humboldt Bay), Crescent City, Port Orford, Umpqua, and Gardiner City, in Oregon; Esquimaux, Victoria, in Vancouver's Island; and Port Townsend, Steilacoom, and Olympia, in Washington Territory.

6. The Panama, New Zealand, and Australian Royal Mail Company's Steamers. This company has a yearly subsidy of 90,000*l.*, for the main line, to be increased to 110,000*l.*, if the New Zealand Government should require the rate of speed to be increased to ten knots an hour. That sum, with the subsidies for intercolonial services, would make an aggregate of upwards of 150,000*l.* per annum.

The imports and exports of the Australian colonies for 1863 were :

Imports	.	.	.	.	.	.	.	£34,264,597
Exports	.	.	.	.	.	.	.	28,378,355
Total								£62,642,952

The exports included £12,677,319 of bullion and specie.

7. The Pacific Mail Steamship Company's monthly line, running between California and China, consisting of four first-class steamers of from 3000 to 4000 tons, for which they receive a subsidy of 100,000 dollars per annum, under contract with the United States' Government for 10 years, from November, 1865. The route *viâ* Kanagawa is 6200 miles long.

8. The California, Oregon, and Mexican Steamship Company's monthly line from San Francisco to the Sandwich Islands, under contract with the United States' Government, dated September 5, 1866.

By the old way of transit, one had to flounder on through heavy swamps, across rapid streams, along the borders of deep ravines, and over precipitous hills, exposed alternately to the drenching rain and the broiling sun. But there is no longer either difficulty or discomfort to be feared in crossing the Isthmus. Now the railroad, passing, as it does, through the heart of a primeval forest, and among the wildest and most picturesque hill scenery, along beautiful rivers, fertile plains, and luxuriant lowlands, where the vegetation at every season is varied and gorgeous beyond comparison, affords the traveller an opportunity of easy enjoyment of, and acquaintance with, inter-tropical nature, unsurpassed in any part of the world.

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BALDWIN LATHAM, PRESIDENT, IN THE CHAIR.
 ON THE ISTHMUS OF DARIEN AND THE SHIP
 CANAL.*

BY DR. CULLEN.

THE UNITED STATES OF COLOMBIA.

UP to the end of the first decade of the present century Spain held undisputed sway over the northern part of South America, which then constituted the Captaincy-General of Caraccas (Venezuela) and the Viceroyalty of New Granada. In the latter was included the Central American Isthmus as far west as Costa Rica. In 1806, a futile attempt to revolutionise Venezuela was made by General Miranda. In 1810 commenced the general revolt of the Spanish colonies against the mother country, which was brought to a successful issue by Simon Bolivar, the Liberator, in Venezuela, New Granada, and Equador, by San Martin and Sucre, in Peru, and by Iturbide and Santa Anna, in Mexico. The following are the principal events of this prolonged war between the European Spaniards and the native Creoles, the horrors of which were increased by the extraordinary natural difficulties of those countries, and the total absence of roads properly so called.

1810, July 20, Antonio Amar Borbon, the last Viceroy, overthrown at Santa Fè de Bogotà.

1811, March 28, General Baraya (Republican), gained the battle of Palacè, in Popayan.

November 12, a congress held at Bogotà, which, following the example of Venezuela, proclaimed the Republic.

1814, December 12, Bolivar stormed Bogotà, and overthrew the government of Cundinamarca.

1815, April 13, General Pablo Morillo arrived at Porto Santo, in Venezuela, with 15,000 men from Spain. December 5, Morillo took Carthagena by famine after 116 days' siege.

* Reference is made to the map which accompanies Dr. Cullen's first paper.

1816, May 30, Morillo entered Bogotá. June 13, Morillo shot the maiden Policarpa Salavarrieta and others. 1819, August 7, Bolivar defeated and took Barreiro at Boyacá, in the province of Tunja. August 10, Bolivar took Bogotá. December 17, a law was passed by the Congress of Angostura (now Ciudad Bolivar), on the Orinoco, in Venezuela, creating the Republic of Colombia by the union of Venezuela and New Granada; Bolivar elected President, and Francisco A. Zea, Francisco de Paula Santander, and Roscio Vice-Presidents. 1820, San Martin obtained possession of Lima. 1821, May 6, the installation of Congress took place at San Rosario de Cúcuta, in the province of Pamplona. June 24, a decisive victory gained at Carabobo, in Venezuela. October 11, Carthage taken from the Spaniards by Montilla. November 17, Panama taken by Bolivar. 1822, May 24, a great victory gained by the Republicans at Pichincha, in Equador. May 29, Equador, the former Viceroyalty of Quito, joined the Republic of Colombia. August 3, Maracaybo in Venezuela capitulated. 1823, November 10, Porto Cabello, Venezuela, capitulated to José Antonio Paez.

1824, June 1, last Spanish battle in Colombia fought at Barbacoas, in the province of Pasto. December 9, last Spanish battle in South America gained by the Colombians and Peruvians, under Sucre, over the Spaniards, commanded by the Viceroy Canterac, at Ayacucho, in Peru. 1825, September 15, the castle of San Juan de Ulloa, in Vera Cruz harbour, the last stronghold of Spain in Central America, surrendered to General Santa Anna by General Don José Copinger, after a prolonged defence during which most of the garrison died of fever or famine. 1826, January 29, the Spanish flag waved for the last time on American soil, the garrison of Callao, in Peru, under General Rodil, having surrendered by capitulation to General Sucre.

1829, November 24, Venezuela seceded, under Paez, from Colombia. 1830, June 4, assassination of Marshal Antonio José de Sucre at the pass of Berruecos in Pasto. December 17, Bolivar died at San Pedro, in the district of Marmato, near Santa Martha. 1831, Colombia dismembered by the separation of Equador, and the independent Republics of Venezuela, New Granada, and Equador formed. 1857, during the Presidency of Citizen Mariano Ospina, the thirty-six provinces and two territories of New Granada united into eight Federal States, and the title of the Republic changed to that of the Granadian Confederation.

1861, July 18, after the taking of Bogotá, during the last of the civil wars which have distracted New Granada, and

which lasted from 1859 to 1863, the title of the Confederation was altered to that of the United States of Colombia, by a decree of General Tomas Cipriano de Mosquera, the provisional President, and commander of the liberal forces.

Mosquera had been President from 1845 to 1849, was again elected by the people in 1865, and entered into office in March, 1866; but was taken prisoner, tried, and banished for four years, in 1867.

THE STATE OF THE ISTHMUS.

It is to the United States of Colombia that the narrow neck of land, extending from the continent of South America to Costa Rica, belongs. The western third is the Isthmus of Veraguas,* or Chiriqui; the central, the Isthmus of Panama; and the eastern third, the Isthmus of Darien. Taken together, those isthmi form the State of the Isthmus (*Estado del Istmo*), which extends from lat. $6^{\circ} 50'$ to $9^{\circ} 40'$ N., and from long. 77° to $83^{\circ} 10'$ W. Its length is 460, and its average breadth about 50 miles. The narrowest part is 27, and the widest 105 miles.

Its configuration is that of a bow, the coast of the Caribbean Sea forming the convex, and that on the Pacific the concave line. It is bounded on the N. by the Atlantic, on the S. by the Pacific, on the E. by the Gulf of Darien, the river Atrato, and the province of Chocò, and on the W. by the republic of Costa Rica. The boundary line between the state and the province of Chocò runs from the mouths of the Atrato, in the Gulf of Darien, up that river to the confluence of the Napipi with it, up the Napipi to its sources, and from thence across the Cordillera to the mouth of the river Cupica, in Cupica Bay, on the Pacific. The boundary between it and Costa Rica runs from Punta Burica, on the Pacific, to the mouth of the Changuenè, or Dorachos, on the Atlantic. It is divided into the provinces of Panama, Azuero, Veraguas, and Chiriqui (formerly Bocas del Toro), and the territory of Burica. These are subdivided into cantons, each having several parishes. The total civilised population of the state, according to the census of 1851, was 138,108. To this may be added 5000 for the estimated number of the independent Indians of Veraguas and Chiriqui, and 3000 for those of Darien, making the total 146,108. The state sends

* Veraguas gave the title of Duke to Columbus and his descendants. It was once abolished by the King of Spain, but restored after a lawsuit which the Colón (Columbus) family carried on against the Crown for more than thirty years. The late Duke of Veraguas, Count of Jamaica, &c., Don Pedro Colón, was elected President of the Cortes of Spain, about the end of 1864, and died in 1866.

three senators and three representatives to the general Congress at Bogotá.

In the time of the Spaniards the whole isthmus constituted the province of *Tierra Firme*. In 1821, during the War of Independence, it was incorporated with Colombia. Upon the dismemberment of that republic, in 1831, it became a province of New Granada. In 1857, it became a state of the Granadian Confederation, and, in 1861, of the United States of Colombia.

THE ISTHMI OF PANAMA AND DARIEN.

The Isthmus of Panama comprehends the western part of the province of Panama. The Isthmus of Darien constitutes nearly one-half of the State. Having, however, only a very scanty population, it is under the jurisdiction of the province of Panama, of which it forms a canton, which is twice as large as the rest of the province.

The boundary between it and the Isthmus of Panama, as determined by a decree of Congress, dated Bogotá, August 7, 1847, is a line drawn from the mouth of the Chepo,* or Bayano, in the Gulf of Panama, up the Chepo, across the Cordillera to the mouth of the Mandinga, in the Gulf of San Blas, and round its shore to Cape San Blas, corresponding nearly to the meridian of 79° W.

MOUNTAINS.

The surface of the isthmus is extremely irregular, being traversed by a chain of mountains, which is a continuation of the great Cordillera of the Andes, and intersected by the spurs and ramifications which it sends off in various directions. The Cordillera, which follows the direction of the Pacific coast, close to which it runs, passes from Equador into Colombia in about 1° N., and, after traversing the provinces of Pasto, Popayan, Buenaventura, and Chocò, enters Darien in about 6° 18' N., inland of Cruces Point. From Equador, in which republic it rises above the lower limit of perpetual snow, its altitude rapidly decreases to Buenaventura river, and thence to the San Juan. In about 7° 30' N., near the height called Alto de Espavè, it bifurcates. The western branch continues to run close to the Pacific, and terminates in the beautiful mountain of Garachiné, behind the point of the same name, which is the S. entrance

* The town of Chepo, population 1536, is in the Canton of Panama. It is situated a few miles from the Gulf of Panama on the Mamoni, a river the lower course of which is parallel to and a short distance west of the lower course of the Chepo.

of the Gulf of San Miguel, and the S.E. entrance of the Gulf of Panama. The height of this mountain is about 3000 ft., and it is said to contain veins of gold in quartz rock. Between the San Juan and Garachiné there are three depressions. The first is between the Quebrada del Mar (as the head stream of the Cupica is called) and the Napipi, where the Piè de Ande is estimated at only 500 ft. elevation. The second, further north, is between the Chuparador and the Hingador, the lowest summit level being 947·44 ft. The third, between the Jurador and the Salagui, has an elevation of 1063 ft. The height of this chain inland of Ardita Point is about 3000 ft. The most conspicuous summits which it presents are Cerro del Zapo (the Mountain of the Toad), half-way between Garachiné and Port of Pines; the Peak of Espavè, S. of the latter; and Jananò* and the Pyramid, inland of Cape Corrientes. At some points the mountains come down quite close to the shore, but generally there is a narrow belt of low land along the coast; and, at the mouths of the San Juan and other large rivers, there are swampy deltas submerged in the rainy season. Nowhere, however, do many miles intervene between the shore and the high land.

The other branch of the Cordillera runs across to the N.E. towards the Atrato, separating the lower course of that river from the head of the Tuyra. From a point only a few miles distant from the Tarena mouth of the Atrato it follows the curved direction of the Atlantic coast, running parallel to it, at the distance of from two to five miles, as far as Cape San Blas, where it enters the Isthmus of Panama. The high range between the sources of the Tuyra and the Atrato valley is the Sierra de Maly, which sends off some spurs, called the Cacarica hills, that approach the west bank of the Atrato, coming down nearly as far as the lagoon on the Cacarica river just above its mouth. Between the head-waters of the Paya, a tributary of the Tuyra, and the Arquia, which falls into Caño Tarena, the west or main channel of the Atrato, near its mouth, is Chacargoon, or Tagargona, mountain, in which there is said to be an abundance of very fine gold-dust, called by the Indians *aasites*. North of it is Chistata mountain, in which there is a great waterfall. Between the Atrato mouth and Cape Tiburon the Cordillera takes the name of Sierra de Estola, and presents the peaks of Candelaria, Tarena, Gandi, and Pico de Cabo, or Tiburon. Inland of Carreto harbour is the Peak of Carreto, and N.W. of it is the break in the Cordillera, which will be noticed hereafter as affording great facilities for the construction of a ship-canal.

* An extinct volcano in Chocò.

Inland of Sassardi Point the Cordillera appears suddenly to terminate, and a new chain to arise a little behind its extremity. From thence to Cape San Blas it presents some notable peaks, which may serve as marks for the various anchorages within the islets and cays forming the Archipelago of the Mulatas. They are named Navagandi, Putrigandi, Kweetee or Mosquitos, Rio Monos, Playon Chico, Playon Grande (two peaks), Concepcion (four), Cerro Meseta, inland of Rio Azucar, La Orqueta, and another, inland of Rio Diablo, Rio Mangles Peak, or Cerro Gordo, and Carti, all of which, except Meseta and La Orqueta, are inland of the mouths of rivers of the same names. Close to San Blas Point it is 2300 ft. high.

From Cape San Blas, where the Isthmus of Panama commences, to Portobello, a distance of 45 miles, the coast runs westward, the only inhabited places on it being the hamlets of Culebra, Palenque, and Nombre de Dios, founded by Don Diego de Nicuesa; these have an aggregate population of about 150 negroes, who are descendants of Cimarrones, or Spanish maroons. The Cordillera in this part of the Isthmus presents the peaks of Saxino, Nombre de Dios, and Capira.

A little west of Portobello, it becomes broken into a series of oblong ridges and conical hills, having their bases skirted by plains. Inland of Navy Bay and Chagres its continuity can no longer be traced, the hills thereabouts being isolated and detached, and only from 200 to 400 feet in height. The ravines which separate them are but little elevated above the general level of the country, and are intersected by streams; and immediately inland of Navy Bay is the great Mindi swamp, across which the Panama Railroad was constructed.

A few miles west of Chagres the hills become connected, and the Cordillera, gradually becoming more elevated, rises to a great height in Veraguas and Chiriqui, where it forms an elevated plateau or table-land, called La Mesa, the highest summits of which are Mount Chiriqui, 11,266, and Mont Blanc, 11,740 ft. high. From thence it declines towards Costa Rica.

RIVERS.

The Isthmus abounds in rivers, the number of which, exclusive of the small periodical streams, cannot fall short of 200. In the rainy season every mile of land is intersected by a flowing stream, which carries off the surplus water. In the time of the heaviest rains the rivers rush along with irresistible force, bearing along with them great rafts of bamboos, trunks of trees with the branches on them, and islands of floating grass. Those opening on the Atlantic coast of Darien, from the Tarena mouth

of the Atrato to Cape San Blas, are the Tarena (an independent river), Tutumati, Tripogandi, Gandi, Pinololo, Miel, Anachucuna, Malahazai, Carreto, Aglatumati, Aglaseniqua, a considerable river of unknown name that falls into Caledonia harbour, the Sassardi, Navagandi, Putrigandi, Tres Bocas, Kweetee, or Mosquitos, Zambogandi, Cocos, Pitgandi, Monos, Playon Chico, Playon Grande, Concepcion, Azucar, Diablo, Mangles, Macollita, Carti or Cedar, Carti Chico, Mandinga, and Culata.

Those falling into the Pacific from Cruces Point to Garachiné Point are—the Cupica, Corredor, Paracuchichi, Jurador, and Piñas.

Between Punta Brava and the mouth of the Chepo, the Gulf of Panama receives the Buenaventura, Pernado, Orado, Trinidad, Manjué, Chimán, Boca fuerte, Hondo, Manglar, Muestra, Oquendo, Pasigua, Lagartos, el Griego, Centinela, and Santa Cruz. Off Buenaventura mouth are the Farallones Ingleses rocks; and inland of Hondo mouth are Column, Thumb, and Asses' Ears Peaks. Off the Chepo is Chepillo Island, and off the Chimán are Mahaguey and Maguey Islands.

SEASONS.

The seasons are the rainy and the dry. The rains commence with the new moon, in April, and continue seven or eight months until the end of November or December. In the district of Biruquete (the extreme south of Darien) and in Chocò, they are prolonged for ten or even eleven months. Slight at first, the rain gradually increases, and is fully established at the end of May, when it falls in torrents, accompanied with terrific bursts of thunder and flashes of lightning. In June, July, and August there is sometimes a heavy shower every day for several successive days. The air is loaded with moisture, and mists with calms or variable winds prevail. Although the temperature seldom rises above 87° Fahr., still, perspiration being impeded, the atmosphere feels extremely hot and close.

In the height of the rainy season, when the sun is at its greatest northern declination, the rains are suspended, and for nearly a week after the 20th of June the sun shines with the greatest splendour, and the sky becomes clear and serene. No instance is known of irregularity in the recurrence of this singular and unexplained break in the ordinary course of the season. The same phenomenon occurs in Demerara, Venezuela, and probably in all the north of South America, within Humboldt's "zone of constant precipitation." This period of dry weather is called *el veranito de San Juan*, or the little summer of St. John, because it commences on the 21st of June, St. John's-

day, which is kept as a festival of great social enjoyment throughout Spanish America. It may be observed, *en passant*, that a custom, evidently of Druidical origin, prevails amongst Celtic nations of lighting bonfires on the tops of the mountains on the night of the 20th of June.

Towards the end of November or December the rains diminish in frequency, the clouds begin to disperse, and, with the commencement of the new year, the N.W. wind sets in. An immediate change ensues, the air becomes more pure and refreshing, the sun shines brilliantly, the sky becomes blue, not a cloud is to be seen, and the climate displays all its tropical beauties. The heat, although greater, ranging between 75° and 94° , is less felt, as the atmosphere is almost free from moisture. The almost vertical rays of the sun are then very powerful, the rise of the thermometer to 124° , when exposed at noon to their full influence, being no uncommon phenomenon.

Some precise information regarding the amount of the rainfall on the Isthmus has probably been communicated to the Smithsonian Institute at Washington by Dr. Quakenbosch, of Aspinwall, the physician to the Panama Railroad Company, who received a set of meteorological instruments from that body in November, 1862.

On the Isthmus the days and nights are always of nearly equal length, the sun rising about 6 A.M., and setting about 6 P.M.

CLIMATE.

The Isthmus, being so near the equator and having so vast an extent of forest and uncultivated land and so great a rainfall, has, naturally, a hot and moist climate. Nevertheless, with the exception of a few localities, it may be regarded as being healthy, and more favourable to the constitution of the Caucasian race than that of most intertropical countries. The mouths of rivers which have deltas, inundated or drowned lands in their vicinity—as those of the Atrato and the Chagres—are unhealthy. So are Portobello and Aspinwall, owing to the swampy nature of the soil in their neighbourhood. In such places remittent fevers, of a type much milder than the yellow fever, occasionally attack Europeans and North Americans, but seldom prove fatal. Where the ground is elevated a few feet above the level of the sea, and there are no swamps, no endemic exists, except the intermittent fever, which prevails all over South and North America, and even in Canada. It is much milder than in the West Indies, or even in the Western States, and is by no means obstinate. The cold stage is generally either entirely wanting, or passes off in a momentary chill, whilst in the Demerara

ague there is frequently a rigour of four hours' duration. The hot stage seldom lasts more than four hours, or the sweating stage more than two. The usual form is the tertian, which recurs every second day, the patient being well on the day between every two attacks. The quotidian, in which there is an attack every day, and the quartan, in which the paroxysm comes on every third day, are rare. The attacks are few in number, and probably the average may be only five or six. The complaint yields readily to sulphate of quinine,* the efficacy of which is much increased by administering the tincture of sesquichloride of iron, or steel drops, in combination with it.

It is quite possible, however, for a person to live on the isthmus for months, or even years, without ever suffering from an attack of fever. Colonel Lloyd states that the family of the British consul resided four years in Panama without an hour's sickness; and Lloyd and Falmark were seventeen months on the isthmus, during the whole of the time exposed to the utmost rigour of the sun and rain, yet they escaped with entire impunity.

The comparative healthiness of the Isthmus may be owing to the great quantity of rain that falls washing away the decomposing vegetable matter, and absorbing the morbid gases evolved; whilst the rivers rapidly carry off the surplus water, and prevent it from lodging and forming stagnant pools. The equability of the temperature, which is not subject to great vicissitudes or sudden changes, the range of the thermometer being within narrow limits, never falling below 75° (on the lowlands), and rarely rising above 95°, also contributes to the healthiness of the climate.

Negroes sometimes suffer from slight cutaneous diseases, but *elephantiasis Arabica*, or "Barbadoes leg," is not so common as in other parts of New Granada. The true leprosy (*lepra Græcorum*), which is common enough in Carthagera and Demerara, in both of which there are lazarettoes† for patients afflicted with that loathsome disease, does not seem exist on the Isthmus. *El coto*, or goitre—the enlargement of the glands of the neck, so common on the high mountains of New Granada—is unknown on the Isthmus.

* Bebeerine, the active principle extracted from the seeds and bark of *Nectandra Rodiæi*, the Greenheart or Sipiri, of Demerara, is also a powerful anti-periodic. The tree belongs to the class and order Dodecandria Monogynia, and the family Lauraceæ.

† On Tierra Bomba, near the former, and at Accaweeny Creek, Pcmeroon River, in the latter.

THE FOREST.

The Isthmus of Darien is covered throughout with a dense and trackless forest, extending from the summits of the highest mountains to the very edge of the sea, and broken only by the courses of the rivers. This renders it impossible to see more than a few yards ahead, and constitutes the greatest difficulty the explorer has to contend with. The trees grow in a soil of great depth, and of such amazing fertility that it would serve for manure for other lands. They are of all sizes, from 30 to 150 ft. in height, and have between them a multitude of shrubs and a close undergrowth of herbaceous plants. The trees support numerous trailing vines and creepers, known by the names of vehucos, lianas, nibbees (in Demerara), and bushropes (in the West Indies). These ascend to their tops and fall in matted festoons, forming a perpendicular wall of foliage, which would delight the eye of an artist, but would totally impede the operations of the surveyor. Orchideæ and other parasitic plants, in great numbers and variety of form, cling to their trunks, encircling them with flowers of every hue.

Of palms, the most abundant are the troolies (*Manicaria saccifera*), itas or morichis (*Mauritia flexuosa*), and other fan palms, vernacularly known as *guagaras*, which occupy the greater part of the space between the tall trees. Another palm very common is the corozo colorado, sillico, or hone palm (*Eläis melanococca*), which yields an oil identical with the palm oil of commerce, the produce of its African congener, *Eläis Guineensis*. The principal timber trees are cedar (*Icica altissima*); mahogany (*Swietenia mahogani*); lignum vitæ, or guayacan (*Guaiaacum officinale*); silk-cotton (*Bombax ceiba*); espavè (*Anacardium rhinocarpus*); bamboo (*Bambusa arundinata*); bullet tree (*Mimusops* sp.); crabwood (*Carapa Guianensis*); ebony (*Diospyros* sp.); hobo (*Spondias lutea*); iron wood (*Ybera puterana*); laurel (*Cordia gerascanthus*); locust, carob, or algarrobo (*Hymenæa courbaril*); mora (*Mora excelsa*); quiebra hacha, or break-axe (*Hymenæa pentaphylla*); quira (*Platymiscium polystachyum*); Tonquin-bean tree (*Coumourouma odorata*); and a very durable wood called yaya. The quipo tree is also very common: it grows to a height of 70 or 80 ft., perfectly straight, and has no branches except at the top; the bark is very thin, and the wood quite white and extremely hard; it is, perhaps, the caoba of Spanish and the bastard mahogany of English wood-cutters.

Monkeys, perezas, or sloths, dantas, machos del monte, or tapirs, a small deer like the wirribocerra of Mexico, the sayno,

havali, cafuchi, warree, or white-lipped peccari (*Dicotyles labiatus*), and the tatabro, or collared peccari (*Dicotyles torquatus*), conejos, or rabbits, and squirrels are plentiful. Amongst the birds are flamingos, or curri-curris, parrots, pigeons, humming-birds, and three kinds of wild turkey of large size, viz., the guam, guan, pava del monte, or crested wild turkey (*Penelope cristata*); the powhi, or crested curassow (*Craalector*), and the powhi de piedra (*Ourax pauxi*).

THE ISTHMUS OR CANTON OF DARIEN.

This Isthmus, which was at one time a separate province, was afterwards reduced to the status of a canton of the province of Panama, which it continued to be until the 2nd of June, 1846, when, in consequence of the representations of Anselmo Pineda, the Governor of Panama, it was constituted a territory, under a prefect with a salary of 1500 dollars a year. On the 7th of August, 1847, its boundaries were fixed as already given. By another decree, dated Bogotá, June 22nd, 1850, it was again reduced to the status of a canton, under a jefe politico, or chief of police, with a salary of 500 dollars per annum.

Its length is about 210 miles, its greatest breadth 90, and its narrowest part, from Chepo mouth to Mandinga Bay, 27 miles.

SOUTH DARIEN.

The following was the population of the South of Darien for the years 1822, 1843, and 1851:—

	1822.		1843.		1851.
Yavisa, the capital	341	...	332	...	287
Santa Maria . . .	245	...	204	...	145
Chapigana . . .	162	...	296	...	268
Pinogana . . .	146	...	142	...	164
Tucuti	113	...	155	...	106
Fichichi* . . .	100	...	abandoned.	...	...
Molineca . . .	35	...	78	...	77
Cana	30	...	abandoned.	...	...
Garachiné . . .	...	...	..	...	162
Chiman† . . .	...	...	...	...	276
	<hr/> 1172		<hr/> 1207		<hr/> 1485

* Fichichi, where there was a fort, was on the west bank of the Chuganaqua, between its mouth and Yavisa. A negro, named Marcellino, who was alive in 1849, was the last survivor of its former inhabitants.

† Chiman, at the mouth of the river Chiman, in the Gulf of Panama, although in Darien, is under the jurisdiction of the canton of Taboga.

BIRUQUETE.

The coast of the extreme south of Darien, from Garachiné to Cupica Bay, and the Cordillera inland of it, were formerly called Biruquete, and, about thirty years ago, constituted a district, under the jurisdiction of a corregidor, with the title of the Corregimiento of Jurador; but of late years this has been completely neglected. The only settlements in it are a few huts at the Jurador mouth and on the Nerqua and Chupipi, twelve huts at Paracuchichi mouth, inhabited by negroes and samboes from Panama and a few Jamaica men, and a little hamlet at Cupica. It was once the resort of deserters, gimarrones, or runaway slaves, and fugitive criminals from Panama. It was to this coast that the Indians of the north of Darien directed Pizarro, telling him to go to Biruquete (probably meaning "the southern country") to search for gold; and it was from the wrong application of the name of Biru that that of Peru was derived. On the Biru, which was then governed by the cacique Biru, was the village the inhabitants of which he named Pueblo Quemado or burnt people. He gave the river the name of Rio de Hambre, or hunger river, and it is now called the Jurador. Biruquete formerly included all the country from the Atrato and the San Juan to the Pacific, but the town of the Noanamà Indians on the San Juan; but all to the south of Cupica is now in the province of Chocò. Noanamà, the people of which still retain their own language, has a population of 3510. Biruquete was visited successively by Vasco Nuñez, Andagoya, Pizarro, and Almagro. It includes the lines for a ship canal from the Atrato and Truando to the Paracuchichi, and from the Atrato and Napipi to the Cupica, which were surveyed, but found to be impracticable. By some this narrow tract between the Atrato and the Pacific is called the Isthmus of Chocò.

RIVER TUYRA.*

The Tuyra, Rio Grande, or Santa Maria, is the largest of the rivers of Darien, the Atrato being included in the province of Chocò. It traverses the greatest part of the space between the Atrato and the Gulf of San Miguel, running from E.S.E. to W.N.W. Its head-waters are separated from the valley of the Atrato by the Sierra de Maly, and the Cerro del Espiritu Santo.†

* It is worthy of note that Tuyra is the name of the devil in the languages of both the Darien and Caribsee Indians, by which tribes he was formerly worshipped.

† Its entire course may be estimated at 94 miles.

Inside of Boca Chica and Boca Grande, the mouths by which it discharges itself into Gulf of San Miguel, it forms a magnificent estuary extending eight miles up, with an average width of three miles, and great depth of water. Into this fall the Savana on the N. and the Seteganti* on the S. Inside Boca Chica and opposite the Savana mouth, there is a settlement, called La Palma, established in 1851 by Marcado and Damian Gonzales. The former was a native of Chocò, whose father had been canoe-man to Captain Cochrane on his journey in Chocò in 1824. Seven miles above Boca Chica is the mouth of the Seteganti, an uninhabited river: about a century ago, there was an Indian village there. On the bank of this river a negro of Chapigana was murdered in 1849 by some person, who chopped him in the back of the head with a machete or bush cutlass, just as he was about to jump across it, he having previously flung his bundle over to the opposite bank.

CHAPIGANA VILLAGE.

Two miles above Seteganti mouth is the village of Chapigana, which Vasco Nuñez de Balboa made his head-quarters after the discovery of the Pacific. The people are all negroes, and are governed by two corregidores. Mr. Andrew Hossack, commonly called Don Andres, an Inverness man, resided there for many years, and carried on wood-cutting and boat-building, having always kept a sufficient number of hands at work, by means of a system by which he held many of the men of the village in bondage. It consisted in giving large credit to all comers for *aguardiente*, *anisado* (a liquor impregnated with oil of aniseed, like the *rachi* of the Greeks), brandy, tobacco, &c., and then making a sudden demand for payment, and obtaining a decree obliging them to pay off the debt in labour, with the alternative of the stocks, if recusant. The same system was carried on in Molineca by Gregorio, and in Pinogana by Requero. It is probably common in that part of South America, for when, in 1832, the government of Equador sent a body of political offenders and convicts to Charles Island, one of the Galapagos, under the governorship of Don José Vilamil, that gentleman opened a store in which, in lieu of money, he demanded for his goods mortgages on the crops grown by the settlers; but the plan ended badly, for, three years afterwards, the people exasperated at his rapacity chopped him down with their machetes. During the author's visit to Darien in 1849 and 1850 his movements were free, owing to the absence at that time of

* This word is compounded of *Sete*, a species of willow that grows thereabouts, *gan*, a village, and *ti*, a river.

Don Andres ; but in 1851 that gentleman caused his detention at Chapigana for three weeks, by secretly forbidding the people to hire him a canoe. For a few years he was in partnership with another Inverness man, named Robert Nelson,* but the latter left Darien several years ago.

A Portuguese, named José Maria Troncoso, but commonly called Don Pepe el Niopo (the European), who had been a sailor in a slaver trading between St. Paul de Loando and Brazil, resides there, and carries most of the traffic between Chapigana and Panama in his bongo. The village is partly situated on a very small swamp, which is almost the only one in Darien ; close behind it is a well of good water, and behind that a hill with a running stream. At this place, on a hillock just behind Hossack's house, is a ruined fort ; there are also ruins of forts on the top of Boca Chica Island, and at Real de Santa Maria, and Yavisa.

LA MAREA RIVER. Six miles higher up, also on the south bank, is the mouth of La Marea, at the head of which the Spaniards once worked a gold mine. Dr. Lebreton, a physician of Panama, M. le Roi, and M. Hellert, who went up to its head, state that gold exists in large quantities in the pozos or wells in which it has its sources.

RIO BALSAS opens two miles higher up. On separate branches of it are the village of Tucuti and the hamlet of Camoganti, near which there are placeres or gold washings. This river was so named by Vasco Nuñez because he constructed rafts on it.

CHUQUANAQUA RIVER. Sixteen miles above Rio Balsas, or thirty-three miles above Boca Chica, the Chuquanaqua opens on the N. bank of the Tuyra, and is about 120 ft. wide at its mouth. This very tortuous river rises somewhere to the W. of Navagandi mountain, not far from the sources of the Chepo, which runs in the opposite direction. From its head it has a S. by E. course to Yavisa, where it bends to the N.W. for three miles to the Tuyra. The distance from its head to Yavisa, in a direct line, is 47 miles : by the windings of the river, the reaches of which approach every point of the compass, it must be considerably over 100 miles. The distance from Sucubti mouth to Yavisa, in a straight line, is thirty-eight miles. From its mouth to the first falls, eighteen miles above Yavisa, it has a pretty uniform depth of three fathoms, and an average width of 70 ft. Higher up it is much obstructed by ledges, bars, and rocks. The principal affluents on the W. are the Izquinti, Artuganti, La Paz, Meteti,

* Not the Robert Nelson who, with Mr. Kennish, guided Commander Prevost.

and Cheviniena, which rise in the ridge between it and the Savana. The tributaries, which open on its E. bank, rise from the Pacific slope of the Cordillera that runs close to the Atlantic coast. From its source down they are named the Uslucapanti, Arquiatí, Chieti, Moreti, Sucubti, the united streams of the Chueti and Tubuganti, Ucurganti, Tuquesa, Tichibucua, Tupisa, and Yavisa. From the head of the Chuquanaqua there is a trail to Cuiquinupti, an affluent of the Cañasas, which falls into the upper part of the Chepo.

The Uslucapanti was reached by Commander Prevost, of H.M.S. *Virago*, on his misguided and unsuccessful attempt to cross the Isthmus from December 20, 1853, to January 7, 1854.*

At the close of the last century there was a small settlement on the Arquiatí, the cacique of which was named Juan de Dios Alcedo; but the Indians, according to their custom, abandoned it when it was found out by the Spaniards.† The Moreti and Sucubti will be referred to in the account of the canal line, which will follow the bed of the latter.

From the Chueti, which falls into the Chuquanaqua, eleven miles S.S.E. of the Sucubti, there is a scarcely recognisable trail across the Cordillera to a point high up the Aglatumati, that falls into Caledonia Bay, on the Atlantic. The author once crossed in that line, but found the Cordillera there to be higher than between the Sucubti and the Aglatumati. This is the so-called Pass of Tubuganti, which is thus noticed by William Patterson in his "Second Proposals:" "In our passage by land from Caledonia Harbour" (he means Port Escoces) "we have six leagues of very good way to a place called Swetee" (Chueti); "from Swetee to Tubugantee we have between two and three leagues, not so passable, by reason of the windings of the river which must often be passed and repassed. At Tubugantee there are ten feet of high water, and so not less in the river till it falls into the Gulf of Ballona" (San Miguel). "This we commonly call the Pass of Tubugantee."

Yaratuba, a place about 20 miles S.W. of Fort St. Andrew, where a skirmish took place on the 15th of February, 1700, between the Scotch colonists under Captain Campbell, of Finab, and a body of negroes, mulattoes and Indians, sent from Panama and

* Ross, Dr., H.M.S. *Virago*. Report of the Exploring Party sent to cross the Isthmus of Darien, in the *Panama Herald*, January, 1854; and in a pamphlet entitled "Over Darien.—Reports of the Mismanaged Darien Expedition."

† This was, however, more probably another Arquiatí, one of the southern tributaries of the Tuyra.

Santa Maria up the Chuquanaqua to reinforce Gen. Don Juan Pimienta, the Governor of Carthagena, who was then besieging Fort St. Andrew, was probably on the Tubuganti.

Indians pass from Tuquesa to Pito, and from Tupisa to Gandi or Acanti, in the Gulf of Darien, in four days. They do not travel to the south of Tupisa; nor do the Granadians venture to trespass north of the Yavisa. With the exception of the Granadian town of Yavisa, the entire course of the Chuquanaqua itself is supposed to be uninhabited, the few settlements of the Indians being on some of its branches.

YAVISA,* the cabecera or capital of the canton, and residence of the Jefe Politico, Don Manuel Borbua, is situated on a peninsula formed by a bend of the Chuquanaqua opposite the mouth of the Yavisa. The houses are of bamboo, thatched with palm leaves. It has a fort in good preservation. There are a few cattle in the small plain on which the town is built, and which is cleared to the foot of the mountain behind it. This plain is 50 ft. or more above the river, the banks of which are there quite precipitous. Walking rapidly up and down one very dark night endeavouring to cool himself during the oppressive heat that precedes a thunder-storm in that climate, the author approached too near the edge of the bank and toppled over, striking his side, in falling, against a projecting point. The river being flooded, he barely touched the bottom, and swam out safely, the splash made by the fall having frightened the alligators away. He met there Mascareño and Pedro Louriano Garvez, two very old residents, who were born at Fuerte del Principe, on the Savana, and were brought away by their fathers, who were soldiers there, when it was abandoned in 1790. They said that there used to be sometimes 400 soldiers at Principe, and that on its abandonment its garrison, consisting of 150 men, was sent to Yavisa. There is not one soldier now in Yavisa.

Dr. Nicolas Pereira Gamba, a lawyer, now of Bogotá, was prefect of the territory from 1846 to 1848, when he was succeeded by Don Antonio Baraya, of Bogotá, who remained until 1850, when Darien became a canton, upon which he was appointed governor of the new province of Azuero. That gentleman, with the view of assisting the author in his explorations towards the Atlantic coast, gave him a letter of which the following is a translation; but his kind intentions were of no avail, as the natives had such a dread of the Indians that he could not prevail on any of them to accompany him, and had to proceed alone as before :

* This Indian word signifies "a maiden."

“Yavisa, January 9, 1850.

“DEAR SIR,—Dr. Edward Cullen proceeds to your town with the view of continuing his explorations. I beg you will be kind enough to procure him the men that he requires for the continuance of his journey, whom he will pay for their services. I hope you have no news.

“I remain your most attentive servant,

“ANTONIO BARAYA.

“The Corregidor of Molinca.”

REAL* DE SANTA MARIA is situated on the Tuyra, just above the mouth of the Pirre, which has a very short course from a high mountain called Cerro Pirre, and falls into the Tuyra a little above the Chuquanaqua, but on the opposite or S. bank. The Governor of Panama sent to this village for confinement thirty of the men from Liverpool, who took Portobello, in 1819, under the patriot or Colombian General, Gregor M'Gregor,† and who were afterwards made prisoners upon the retaking of that place by Santa Cruz and Alessandro Lores. Three of them were killed here, and Colonel Rafter and another at Yavisa. An old Indian woman of Pinogana, who was present when Rafter and his companion were shot by Corporal Rincon, besought him to spare them, crying out “por el amor de Dios, no les mata,” (for the love of God, don't kill them). Don Manuel Gonzales, a native of Spain, who was in Portobello when it was retaken, said that most of the prisoners were confined in the large house‡ opposite the *puerta de tierra* or land gate of Panama, which latter has been thrown down by the Railroad Company; and that one night, a musket rack having fallen down and alarmed the guard, they fired and killed several of them.

Below the Pirre is the site of the old town, which was taken by the Buccaneers in 1680,§ on which occasion they found only 3 cwt. of the gold of Cana, the rest having just been shipped to Panama. It was again sacked in 1685, 1702, and 1712, by the Buccaneers. In 1724 and 1750 the Indians massacred the inhabitants.

* Real means “a camp;” and also a silver coin, worth $\frac{1}{16}$ th of a dollar, or 5d.; but the real of Spain is only half the size and value of that of South America, being only $\frac{1}{32}$ th of a dollar: the adjective real signifies “royal.”

† He afterwards became Cacique of Poyais, in the Mosquito territory, and raised a large sum in London for the colonisation of Poyais on bonds signed by himself alone.

‡ This house belonged to Gonzales, and afterwards to his son-in-law, Don Juan Feraud, a Frenchman.

§ When taken in 1680 by Coxon, Harris, and Swan, Santa Maria had a garrison of 200 men, but was defended only by palisades.

MOLINECA, up to which the tide reaches,* is about four miles above Santa Maria. From the other bank of the Tuyra there is a bush-path, about three miles long, to the bank of the Chuquanaqua opposite Yavisa. Along this path the Cedron (*Simaba cedron*, *Planch*, Simarubaceæ), said to be the best antidote against snake-bites, grows plentifully; and close to the same path, the author saw, in one day, great numbers of snakes assembled together in three different places.

PINOGANA. Four miles above Molineca is Pinogana, the last inhabited place on the Tuyra. The population consists of 164 civilised Indians and Samboes (half Indians and half negroes). The distance from Boca Chica to Pinogana is forty-one miles, and the journey can be accomplished in two tides. During the ebb tide it is usual to tie the boat or canoe to a tree on the bank. Going down with the ebb, the passage can be made in one tide.

The Tuyra, above the confluence of the Chuquanaqua with it, receives on the same, or north bank, the Huanacati, Yapes. Pucro (about fifteen miles above the Chuquanaqua), Paya, Matumaganti, Punusa, Tapanaca, and Nique. Of these nothing is known except that there are a few Indians high up the Pucro and the Paya. The author learned from the Indians that there are two ways of crossing the Cordillera from the Pucro, and two from the Paya. Pucro is a corruption of Pucurru, the Indian name of the balsam or raft-wood tree (*Ochroma lagopus*), which, like the silk-cotton tree (*Bombax ceiba*), and the huge baobab (*Adansonia digitata*), belongs to the Linnæan class and order Monadelphia Polyandria, and to the suborder Bombaceæ of the natural family Sterculiaceæ. The following are the passes:

1. One day's journey up the Pucro is the mouth of the Tapaliza, and two hours up the latter is that of the Mazaquia: from thence a journey of an hour and a half by land leads to Parcaparca, a stream which falls into the Tiperri, a branch of the Paya. From Tiperri mouth to the head of the Paya is one day's journey, and from the latter the Cordillera is ascended in four hours. At its foot on the other side is the head of the Arquia, in the course of which is the lagoon of Tigre, one day's journey from the Tarena channel of the Atrato, into which, six leagues above its mouth, the Arquia falls. 2. One day's journey up the Tapaliza is the mouth of the Apeyac; in one day up the latter the Cordillera is reached, and can be crossed in one day to the head of the Tigre, which falls into the lagoon on the Arquia. 3. The Paya falls into the Tuyra, one day's journey

* But the tide flows there only for one or two hours.

above the Pucro. It is two days from its mouth to its head, one day thence to Chacargoon or Tagargona Mountain, one day to its foot on the other side, one day thence to the Arquia, and one day down the latter to the Atrato. The head streams of the Paya are the Tracuna, and Ucubquia. In Chacargoon there is a rivulet, called Tiyaço, which contains abundance of a very fine gold dust that the Indians call *aasites*. North of Chacargoon is Chistata Mountain which has a great waterfall. 4. One day on foot up the bank of the Tuggule, a branch of the Paya, farther to the south or right; one day across the Cordillera to the head of the Yo; and three days down that river to the Atrato, one day's journey above its mouth.

Above Molineca, on the same, or south bank, the rivers Clara, Uruti, Aruza and Arquati, Siluro, Cupe and Ipeliza, Papa and Piedras, Grande, Escucha Ruidos (hear the noises), Viejo (old), Limon, and Cana fall into the Tuyra. They are all totally uninhabited, as well as all the country from the south bank of the Tuyra to the Pacific.

In 1716 the settlements in the south of Darien were: 1. Santa Cruz de Cana, where there was a large population of Spaniards, negroes, and Indians engaged in gold mining. 2. La Concepcion de Sabalo. 3. San Miguel de Tayecua. 4. San Domingo de Balsas. 5. Santa Maria. 6. San Jeronimo de Yavisa, a *doctrina* or mission. 7. San Enrique de Capeti, or the sleepy. 8. Santa Cruz de Pucro. 9. San Juan de Tacaracuna, and Matarnati, *doctrinas* named after hills in the vicinity. 10. Seteganti, an Indian village, the inhabitants of which, although under subjection to the Spaniards, were not baptised. Some time after 1740 the Spaniards had rancherias, or collections of huts, at Nuestra Señora del Rosario, on the Congo, and on the rivers Zahalos, Balsas, Uron, Tapanaca, Pucro, Paparos (pheasants), Tuquesa, Tupisa and Yavisa, and at Chapigana. About the end of the last century, the fort of Real de Santa Maria was garrisoned by thirty-seven soldiers, and had six pedreros, or small cannons. On the Pirre there were thirteen Indian families, instructed by a Dominican priest; and at Molineca twenty-three families and a priest. Ayuca, four leagues above Molineca, and Yapeti, three turns or reaches higher up the Tuyra, were uninhabited. At the sources of the Cupeti, the mouth of which is seven turns above that of the Yapeti, were the Paparos Indians, who held no communication with the others, and were supposed to be a mixed race of Indians and negroes, and to consist of eighty families. Seven turns above Cupeti, the river Ypeliza opens. On the Cupe, one of the two streams that form it, there was a Jesuit mission consisting of forty Indian families; and at the junction of the two, the Spaniards once had a military

post, but the Indians killed all the soldiers. From the embarcadero or landing-place on the Ypeliza, three days' journey above its mouth, it was half a day's journey by land to Cana : at the landing-place there were three Indian families. At Cana there was a fort with a sergeant and eight soldiers. The inhabitants, most of whom were upwards of fifty years of age, were engaged in mining. In 1780, the entire population of South Darien was 1339. Before that time, the Indians, with the exception of a few families that remained in Pinogana, had completely abandoned it.

NORTH DARIEN.

The Atlantic coast and the country for eight or ten miles inland is very sparsely inhabited by the Darien, San Blas, or Mandinga Indians, who call themselves Tooleh*—a word signifying "people." This tribe was never subdued by the Spaniards, and its independence was recognised by the Government of New Granada about the year 1843.† The Darien Indians have always opposed every attempt to penetrate their country, or even to land on the coast. They do not allow any official or citizen of New Granada to reside in their territory, nor do they permit any of the people of the Granadian villages in the south to cross over towards the Atlantic, to which side they strictly confine themselves, claiming no part of the Isthmus south of the upper courses of the Chepo and Chuquanaqua. So severe have they been on trespassers that, in 1850, they killed four negroes whom they found fishing too high up the Chiman; and two years later they killed five negroes whom they caught hunting within their territory. They always bore great animosity to the Spaniards, and used to make it a point to kill any of that nation that happened to fall into their hands. They were very friendly of old to the Buccaneers, whose allies they were in many incursions against the Spaniards. They are at present very friendly to the English and Americans, *but nevertheless do not permit them to land on the coast.* As soon as a vessel anchors it is boarded by the traders, who bring off their produce themselves, and do not allow the captain or crew to land. They carry on a considerable trade in cocoa-nuts, cocoa-nut oil, cocoa (*Theobroma cacao*), cotton and grass hammocks, and canoes of calli-calli, a red wood like cedar, which withstands the attacks of all insects, and bears wear and tear better than mahogany. They also dispose of large quantities of carey, careta, or tortoise-shell, caoutchouc, and

* But those dwelling on the tributaries of the Chuquanaqua are called Cunas or Chucunas.

† The independence of the Goahiros, who live inland of Rio La Hacha, was recognised at the same time.

tagua, antà, or vegetable ivory, which is the hard albuminous kernel of *Phytelephas macrocarpa*, a diœcious stemless palm.*

Their small settlements are situated, at great distances from one another, at the mouths of the rivers Mandinga, Carti Chico, Carti, or cedar, Rio Diablo, Rio Azucar, Concepcion, Playon Grande, Playon Chico, Rio Monos, Pitgandi, Kweetec, or Mosquitos, Putrigandi, Navagandi, Sassardi, Carreto, Gandi, Tripogandi, Tutumati, and Tarena, which fall into the Atlantic from N.W. to S.E., or from Cape San Blas to the Atrato. Their settlements inland are near the sources of the Chepo, Uslucapanti, Moreti, Asnati, Sueubti, Chueti, Tubuganti, Ueurganti, Tuquesa, Tupisa, Pucro, and Paya, which rise on the Pacific slope of the Cordillera. There are also the villages of Agla and Arquia, three or four miles from the Atlantic. During the season in which they strike the hawksbill turtle (*Chelone imbricata*)† a few huts are occupied by them on some of the coral cays with which the coast is fringed.

Allowing a population of 100 souls, on an average, for each of the nineteen coast villages, and also for Agla and Arquia, and 60 souls for each of the twelve inland settlements, the total population would be 2800, which is probably above rather than under the actual number at present; but, in 1747, Don Joaquin Valcarcel de Miranda, Governor of Darien, estimated the population at 5000 families.

From Cape San Blas to the Atrato not one single patch of cultivated or cleared land is to be seen, either on the coast or the mountains.

At Mandinga, in 1852, the chief was John Bull. It must be observed that two or three of the traders in each settlement adopt English or Spanish names, as the Indians have so great a reluctance to tell their own names, that, when one of them is asked, "Iki peynooka?" (What's your name?), he invariably replies, "Nooka chuli" (I have no name), meaning, perhaps, no adopted name. Carti Chico is a small place, three miles east of Mandinga. Carti, or cedar river, in Mandinga Bay, nine miles east of Mandinga River, was the residence of the oldest chief, Calògwa, who was about 100 years of age. The traders were Vicuña, William, and Tom Dadd. Vicuña, John Bull, and Campbell, who lived at Yantopoo, an island opposite Carti, each of whom was nearly 100 years of age, were present at the signing of the treaty of peace with the Spaniards, in 1787, at

* A full account of this interesting tribe, with a copious vocabulary of their language, will be found in the *Transactions of the Ethnological Society of London*. New Series. Vol. vi., Murray, 1868.

† This is the species most in request for its carapace, or dorsal buckler, the horny plates of which are known as tortoise-shell.

Caledonia Harbour and Portobello. John Bull was baptised at Portobello, the chief of police there being his godfather. Campbell, notwithstanding his great age, was able to walk about, and was quite clear in his intellect. He asked the author to prescribe for his daughter, and wanted some vaccine lymph, which he sent him from Navy Bay. Carti is the largest of the settlements, and may have a population of 200. Rio Diablo, or devil river, the largest village next to Carti, has about forty huts. The chief was named Napa, and the traders were Story and Jack Bragg. At Azucar, or sugar river, the chief man was Crosby. Playon Grande had about thirty huts. The traders were William Shephard and Tom Taylor. The sea-beach is four miles long, and lined with cocoa-nut trees, which grow along the coast all the way from thence to Putrigandi.

Putrigandi had about twenty-five huts. The trader there was Julian or William, who was very friendly and desirous of learning a little English. He also wished to have names given to his sons, and seemed to take much interest in the account the author gave him of the Indians of Guiana and Venezuela. On the way from Sassardi to this place, the boat the author was in was followed by a large canoe with ten paddlers and some men armed with muskets, who fired several volleys. As they were pulling directly towards him, he thought they might be coming to kill him on account of the propositions he had made about a canal across the Isthmus; but, upon asking one of the Indians in the boat what they were firing for, he replied, "quenchaqua Tule tumati poorkweesa" (one great Indian is dead), which explained the matter. Soon afterwards the canoe steered into Navagandi. There are a few huts on a sandy spot on the E. bank of the Navagandi or Mona, and six or seven miles up the river is a settlement. Manchineel trees are abundant in the vicinity.

Sassardi, at the N.W. extremity of Caledonia Harbour and the channel of Sassardi had eighteen huts and about fifty inhabitants. The principal trader was Denis, who had great influence, and caused Gisborne and Forde to be arrested and sent back to their vessel the day after they landed in June, 1852. A fortnight afterwards the author arrived in Caledonia Harbour and sent a message to him, whereupon he came down with about forty men, and told him of the landing of Gisborne and Forde with two sailors. The author endeavoured to get his consent to the survey of the route and the cutting of a canal, but he would not entertain the proposition, and bid him tell the Queen of England not to send any of her people to the coast. He was very friendly, however, called him "aya nugueti" (good friend), and came in his boat to Sassardi, where he gave names to his

two sons, whom he promised to let him take to England on his next visit. He even offered to give him a passage in a canoe to Navy Bay, but afterwards said he could not get paddlers. The result of several discussions on the canal question was that he promised to offer no opposition if the old men of the other settlements consented to allow foreigners to come and cut a canal; and he advised the author to call a formal meeting of the old men to consider the matter. John Bull, the oldest man in the village, was then sick and could not be consulted. At this time an American yacht, and a schooner from the Atrato, belonging to Faustino, called in.

When the expedition of 1854 arrived in Caledonia Harbour, Denis acted as spokesman for the Indians, and gave permission to the engineers to survey the line, promising that they would not be molested, as he had promised Lieutenant Strain, U.S.N., who landed two days before Gisborne's arrival. Although he offered no opposition, and did all that was asked of him, Gisborne used to speak very harshly to him, and at last threatened to have him hanged. To this threat Denis made no reply, but Sassardi village was immediately abandoned, and Denis was no longer to be seen. Soon afterwards, Gisborne and three others, accompanied by Robinson, the Secretary of the old chief of San Blas, and another Indian, who was the guide, left Caledonia for the Savana. They went first to Sucubti, which had been burned and abandoned upon Strain's approaching it, fifteen days before their arrival. Then they proceeded to Moreti, where they were detained, by order of Denis, in the house of the very men who had murdered four sailors of Commander Prevost's party five weeks before. Learning, fortunately in time, that Denis had arranged with the Chief of Moreti that Gisborne and party were to be murdered there, the author hastened to Sassardi, where he found all the houses completely empty and open, with the exception of the upper room in Denis's house, the door of which was shut. Having shouted repeatedly, Denis at last came out, and in an angry voice asked what he wanted. Upon hearing the purport of his visit, Denis at once admitted that Gisborne and party were to be killed, and chuckled with satisfaction at the idea. After a long pow-wow, in which he displayed much cunning, the author succeeded in convincing him that his own safety depended upon countermanding his orders; whereupon he whistled, and, in a few minutes, two Indians pulled over from the river, and Denis had a conversation with them, after which they went back. Denis then said that they would start at once for Moreti, which was three hours' journey, to order the chief to let Gisborne go unharmed. Denis died in 1861.

Although the Sassardi people were friendly to Commander Parsons and his officers during their stay, they did not attempt to conceal their anxiety to get rid of them, and expressed much gratification when told they were about to depart.

CARRETO had about twenty huts, built of manicole palm stems, and thatched with troolie leaves. The native traders were Bolivar, Trueno (thunder), and Smith. Trueno had been in Baltimore, Philadelphia, and New Orleans, and spoke some words of English and Spanish. They said there was a small village a little inland. A young man of this village, named José Pio, had been brought up by a Granadian at Yavisa, but he was then absent. The Carreto people were more opposed than any others to the canal project, and were very sulky and surly. Smith scolded Pedro Ueros, a gentleman from Carthagená, who accompanied the author, and asked him why he did not travel in his own country. On the night of their arrival the Indians fired off pedreros at short intervals for two hours, the shots being answered from some place inland. This detonation seemed to be intended to frighten them away. During the expedition of 1854, when Colonel Codazzi, who was sent by the New Granada Government, with 200 soldiers and convicts to assist in the survey of the Darien Canal Line, encamped them on the beach of Caledonia Bay, at the mouth of the Aglatumati, the Carreto people sent almost daily messages to him, requesting him to take his men away. Codazzi, who was an Italian, was chief of the Chorographic Commission which was engaged in surveying the provinces of New Granada. As he was also part concessionaire of the privilege for a canal by the Atrato route, he did all he could to defeat the object of the Darien expedition, and strictly confined his men to their camp on the beach. He died at Baranquilla, on the Magdalena, in 1859. It was from Carreto that Vasco Nuñez sailed to Agla, in Caledonia Bay, whence he started for the Pacific. He had previously entered into a treaty of friendship with the cacique, whose daughter, Carreta,* he took for his wife. About fifty years ago it was the residence of Quebanna, who was esteemed the wisest of the Darien chiefs. The last chief was José Rosario.

In Anachucuna Bay, there is a small village, where a man named Leon, whose father was a native of Curaçoa, died in 1851.

TARENA VILLAGE, at the mouth of the Tarena, a river a little west of the Tarena mouth of the Atrato, is probably built on the very site of Santa Maria la Antigua del Darien, the first settlement founded in America. It was, and is still perhaps, the resi-

* Carreta, the Spanish word for tortoise-shell, was perhaps introduced from the Indian.

dence of Zapata (Shephard) the half Indian son of old Captain John Shephard, of San Juan de Nicaragua. Tarena is, very likely, a corruption of Darien, which would seem to have been the ancient name of the Atrato, the main channel of which is now called Tarena. Perhaps in the Chocò language, the Atrato is still called Darien.

The Indian population of the north being 2800, and the Granadians of the south 1485, it follows that 4285 people, most of whom are savages, occupy a country 210 miles long, with an average breadth of 50 miles, having a soil of amazing fertility, capable of yielding the most valuable products, and occupying a most commanding position for commerce, situated, as it is, between the Atlantic and the Pacific, with magnificent harbours on each, and at only eight days' steaming from New York and sixteen from England. This seems strange, particularly when we reflect that the narrowest part of the neck of land between the two oceans is there; and that there, also, the first settlement was made after the discovery of America—Santa Maria la Antigua del Darien having been the first town built on the continent of America. Nevertheless, there is yet neither path, track, trail, nor line of transit of any kind across the Isthmus of Darien.

THE ATLANTIC COAST.

THE GULF OF DARIEN OR URABÀ.

Punta Caribana the northernmost point of the Gulf of Darien is low, covered with trees, and surrounded by rocks lying close to it. It is easily recognised because from it the coast trends to the S. to form the gulf, and Cerro del Aguila or Eagle's Hill is near it. This hill lies in Lat. $8^{\circ} 37' 10''$ N., Long. $76^{\circ} 50'$ W., and from it Cape Tiburon, the west point of the gulf bears W. (N. 84° W.), 29 miles distant. Aguila Hill, though only of moderate height, is remarkable in consequence of its being insulated in the centre of low land. Pounces and garnets* have been found in it. The gulf has, then, its entrance between Caribana point, on the E., and Cape Tiburon (shark), on the W., and extends 46 miles to the south from a line drawn between them. Its E. side, for a few miles S. of Caribana point, is in the province of Carthagena, in the State of Bolivar; the rest of that side is in the province of Chocò, in the State of Antioquia. Its W. side, from the Atrato to Cape Tiburon, is in Darien. All its E. and S. coasts to the Bay of Candelaria

* Garnet is a silicate of aluminium, magnesium, and iron. When cut *en cabochon*, that is, of a boss shape, it is called carbuncle.

offer safe anchorage at every season; but the rest of it to Cape Tiburon is very wild in the season of the breezes, and without any shelter except for small vessels; but, in the season of calms, light breezes, and variable winds or vendavales, one may anchor in any part of the gulf without risk of being incommoded by either wind or sea.

Nearly $5\frac{1}{3}$ miles S.S.W. $\frac{1}{2}$ W. (S. 35° W.) from Caribana Point is North Arenas Point, which forms with the south point a low front 2 miles in extent, the bearing between them being S. 19° E. and N. 19° W. These points form the W. dyke of Aguila Lagoon, which extends from thence $5\frac{2}{3}$ miles, and from N. to S. 3 miles, with several low islets in it. This lagoon commences at the S. extremity of Aguila Hill.

From Arenas Point southward the coast trends towards the eastward for $5\frac{1}{2}$ miles to the Rio Salado, and thus forms a tongue of sand extending out to sea, which, although it is low, has sufficient water near it, and may be run along at less than a mile. From Rio Salado the coast trends nearly S.S.E. It is all low land, with hillocks at intervals. The depth on the bank all along it is so regular, and the bottom so clean, that it may be coasted without any other care than attention to the hand-lead. To the S. from Cayman Point and Hill, which are 14 miles from Rio Salado, the shores on both sides are low and swampy, and continue so as far as the delta of the Atrato. At the outermost part of the delta, 25 miles to the southward of Arenas Point, the gulf is contracted to a width of only 4 miles.

From Rio Salado to the mouth of the Suriquilla, in the bottom of the gulf, the rivers Ycoquillo, Urabà,* Cayman Viejo, Cayman Nuevo, Civilo, Cope, Turbo, Guadalito, Karacuarando or Seteguilegandi,† Micura, and Leon fall into it. All these have their sources in the spurs of the Antioquian mountains which approach the east side of the gulf. The Leon or Guacuba is a considerable river, whose principal tributaries are the Cun, Vau, Caño Grande, Ipenegue, Aruy, Chueti, and Carebro. It has a very long course, its upper portion, named Papagana, rising in the Cordillera westward of that part of the valley of the Cauca between Medellin and Santa Fé de Antioquia.

At Turbo mouth, due E. of the Caño Coquito mouth of the Atrato, is a village of about twelve huts raised on stilts to defend them from the water, mud, and insects, and nearly

* On the banks of the Urabà are the ruins of a settlement, which was perhaps San Sebastian, founded by Ojeda in 1510.

† The former is its name in the language of the Choè, the latter in that of the Darien Indians. In the former language, the termination *do* or *dor*, in the latter, *ti* or *di*, signifies a river.

buried in forest. The people employ themselves in collecting caoutchouc, which is abundant in the neighbourhood, and of which Mr. Dean, an English resident, exports a large quantity.

Near Turbo grows the Lana or wool tree. A portion of the roots of this remarkable tree is exposed for 10 or 12 ft. above the ground, covering a circular space of about 20 ft. in diameter. The trunk is 6 ft. in diameter at its lower extremity, and rises to a great height. The bark is often punctured by insects, and the seeds of various plants settle in the wood and germinate; the tree then presents the singular appearance of giving growth to several varieties of leaves and flowers.

Don Antonio Gago, who was commissioned by the King of Spain to examine the mines of Darien, mentions in his report, in 1788, the existence of a silver mine on the rivulet (quebrada) Namaquilla, which rises not far from Cayman, and falls into the gulf near Turbo.

THE DELTA OF THE ATRATO.

From a little west of the river Suriquilla, which falls into the Bay of Candelaria in the southernmost part of the gulf, the delta, through which the great river Atrato or Darien disembogues, extends to the N.W.

The Bay of Candelaria is bordered by the low and swampy land at the mouths of the river, and bears from the point and Morro, or round hillock, of Cayman about S.W., at the distance of 12 miles. For sailing along all this coast of the bottom of the gulf, from Point Cayman, on the E., to the Bay of Candelaria, on the W., there is no necessity for other directions than that of attending to the lead, nor is there any danger, for a ship may be anchored wherever it may be convenient or necessary.

The principal or only object for navigating the gulf is to approach or enter the mouth of the Atrato, which affords great facilities for introducing into the interior the imports, and withdrawing from thence the exports of the province of Chocò,* of which it is the main artery and the only highway. Although this river opens into Candelaria Bay by thirteen mouths, only

* The province of Chocò had, in 1851, a population of 43,649, consisting of negroes and civilised Indians, who, unlike their neighbours in Darien, are very inoffensive. There is a considerable export of gold dust from it; and, in 1841, the imports included 10,000 bales from England. Quibdò, or Citharà, the capital, in lat. 5° 37' N., is 2° 29' 30 W. of Bogotá, and had, in 1851, a population of 8471. It is a miserable collection of mud huts, thatched with palm leaves, built in a swampy situation, and propped up on stilts to defend them from the mud, water, and insects. It stretches about half a mile along the W. bank of the river, and has some trade with Carthagena, Loria on the Sinu, and Novita on the San Juan.

eight of them are navigable for boats or launches ; and, of them all, the Faysan Chico, or Caño Coquito, offers the greatest advantages, because, when anchored in the Bay, vessels will find shelter from the sea, and be near the channel by which their freights are to be carried inland. This arm of the river has 3 ft. of water on its bar, and the tides rise only 2 ft. throughout the gulf.

The coast of the Bay of Candelaria is so very low that the greater part of it is inundated even at low water, and bordered with mangroves, reeds, and rushes, so that only the N.W. part appears dry. The entrance of the bay, from the N.W. to the S.E. point, where the little Faysan falls into it, is about two miles in width ; but there is a sandbank which extends out to a mile to S.E. of the N.W. point, and straightens it to scarce a mile. This shoal also stretches off from the S.E. point, but only to $1\frac{1}{2}$ cable's length. The clear space of good anchorage is about $1\frac{3}{4}$ mile each way.

From the N.W. point of Candelaria Bay the coast continues low and covered with mangroves for nearly five miles, N. 10° W. to Revesa Point ; and thence W.N.W. seven miles to Tarena Cays. On all this coast the shallow bank, thrown up by the waters from the mouths, and consisting of the softest oaze, extends one mile outwards, and is exposed to constant changes. It is therefore necessary to keep at two miles distance from the coast. Revesa, or Chocò, Point forms a curve that presents a fine anchorage, well sheltered from the north winds and breezes. About one-third of the distance from this point towards Tarena Cays is Boca Tarena, the principal mouth of the Atrato, which is so exposed to the breezes that commerce is more conveniently carried on by means of the little Faysan.

Inland and south of Tarena Cays is the Peak of Tarena, on the range of the Cordillera, which runs parallel to the coast only a few miles inland, and presents from N. to S. the peaks named Candelaria, Tarena, Gandi, and Pico de Cabo, or de Tiburon, inland of that cape.

From Tarena Cays the coast runs about N.W. by N. (N. 68° W) ten miles to the Bolanderos Islets, and is high, with a few islets lying along it. The first of these, named Tutumati, is a group of three, about half a mile from the coast, and clean all round. Succeeding them is another named Tambor. To the west of Tambor Islet the coast bends a little inwards, and forms Puerto Escondido, or hidden harbour, which will admit only small vessels. About three miles from Escondido Harbour is Bolandero Islet, of moderate size, having around it several smaller ones, with sufficiently deep water round them ; these do not lie more than three-quarters of a mile from the shore.

At three miles N.W. by W. $\frac{1}{2}$ W. from Great Bolanderos is Piton Islet, clean all round, between which and the coast there is a channel half a mile wide. From thence, at the distance of six miles W.N.W. $\frac{1}{4}$ W., is Tripogandi Point, forming the E. point of a beachy bay, named Ensenada de Tripogandi. From this point the coast continues about N.N.W. $\frac{1}{2}$ W. $1\frac{1}{3}$ mile to the point of the river Gandi, which, with the former, forms the Bay of Estola or Gandi, where the rivers so named disembogue. In this vicinity an island suddenly rose in 1858, as the author was informed the year after by Don Ignacio Pombo, the harbour-master at Cartiagena. About $6\frac{1}{2}$ miles N.N.W. of Tripogandi Point lies Tonel Islet, very clean, with deep water; it is one long mile from the coast. From this islet to Cape Tiburon the distance is $6\frac{1}{2}$ miles N.W. $\frac{1}{4}$ W. All this coast from Tarena Cays to Cape Tiburon is high and precipitous, with deep water off it; but it is very wild in the season of the breezes, for which reason it is most prudent to avoid it during that season, and to keep on the E. side of the gulf, as it not only affords security and the accommodation of anchorage in every part, but there is no inconvenience on that side from the sea; it is also much more easy for working to windward, so that much time may be saved by keeping to it.

Cape Tiburon is the N.W. boundary of the gulf. It is rocky, high, and scarped, and projects out in a N.N.E. direction, forming an isthmus, on the S. and W. sides of which are two little harbours. The first is so narrow as to be of little importance; the second, named Miel Harbour, is larger, and has good holding ground; its greatest depth is from 12 to 13 fathoms, on sand and clay.

From Cape Tiburon a sandy beach extends 13 miles W.N.W. to the point at the foot of the Peak of Carreto, forming Anachucuna Bay, which is about $2\frac{1}{2}$ miles deep. At its N. end, about two miles S.E. of Carreto Point, is the little harbour of Escondido, fit for small vessels only.

CARRETO HARBOUR.

The Peak and Point of Carreto, 13 miles W.N.W. (N. 62° W.) of Cape Tiburon, are at the eastern side of the Harbour of Carreto, the western part being formed by a cluster of islets of various sizes. Between them, at the distance of $1\frac{1}{2}$ mile, is the widest part, the narrowest being one mile. This harbour is of a semicircular form, and falls in about a mile, with a depth of from $3\frac{1}{2}$ to $8\frac{1}{2}$ fathoms. Being exposed to the heavy seas thrown in by the N.E. breezes, it is of use only in the season of light winds. To the north of this harbour, at the distance of a long

mile, there are two little shoals, the Bajos de Carreto, near each other, bearing N.E. and S.W., with 6 fathoms on them on rocky bottom, and near them from 20 to 25 fathoms. With fresh breezes, the sea breaks over them.

At 7 miles N. 48° W. from Carreto Point and Peak is Punta Escoces. On this bearing there are clusters of islets of different sizes, extending out to N.N.E. a long mile from Punta de las Isletas. From Carreto to the latter the coast is high and scarped, but from thence to Point Escoces, 3 miles N.W., it is lower, and has a beach.

Point Escoces is the extremity of a narrow neck of land, about 2 miles in length in a N.W. direction, which forms the N.E. side of Port Escoces.

Port Escoces, Caledonia Bay, Caledonia Harbour, and the Channel of Sassari will be noticed in the account of the Darien Canal Line.

THE ISLE OF PINES.

Its S.E. extremity bears N. 5° W. from the Fronton of Sassari at the distance of 2 miles. In the space between it and the coast there is a channel of two cables' length in width at the narrowest part, with from $1\frac{1}{2}$ to 5 fathoms of water. Off its W. side is the Cienaga or Lagoon of Navagandi, the mouth of which is shut in by reefs. The Isle of Pines is high, with a hill extending along it, on which rise two remarkable points covered with trees. Its greatest extent lies N.W. by N. and S.E. by S. one mile, and its greatest breadth is three-quarters of a mile. Its N.E. and S.E. sides are scarped and bordered by reefs very near the shore. Its N.E. point lies in Lat. 9° 1' 30" N., and Long. 77° 45' 20" W.

On its south side there is a little rill of good water which runs down a gully and into a small basin, but it is so near the shore that an unusual rise of tide washes away the sand, and the sea flows into it. Excellent firewood may be cut to the eastward of the watering-place, but care must be taken not to cut the manchineel tree (*Hippomane mancinella*, *Euphorbiaceæ*), which abounds there and is poisonous. Drake visited this island on the 23rd of July, 1572, and found there two frigates from Nombre de Dios taking in timber. The negroes in those vessels informed him that some soldiers were expected from Panama for the defence of the town against the Cimarrones, or runaway slaves.

THE MULATAS, OR SAN BLAS ARCHIPELAGO.

Two and a half miles N. by W. from the north end of the Isle of Pines is Pajaros, or Bird Island, which is low, narrow, covered

with brushwood, and surrounded by reefs, having 7 and 8 fathoms, on rocky bottom, close to them. At this island commences the extensive Archipelago of the Mulatas, or Samballas (San Blas), composed of islets, cays, shoals, and reefs, which, sweeping round to the N.W., at a considerable distance from the mainland, terminate off San Blas Point, about 80 miles distant. The cays are low, nearly flat, sandy, and thickly wooded. They lie in clusters, having navigable channels between them, leading to secure and sheltered anchorages within them all along the shore. Some of them have springs of good water, and convenient spots for loading and careening, and the fishing and turtling around them are excellent. Great numbers of lime-trees grow on them, and produce large fruit; so that sailors navigating those waters need not fear the scurvy. The main shore is full of sandy bays, with many streams running into them. The largest group is the Holandes, which is about 7 miles in extent from E. to W. The north side of the reef which bounds this group is from 8 to 10 miles from the coast, and the cays are separated from those immediately adjacent to the mainland by a clear opening of 3 miles wide. A vessel being 3 miles N. of Pajaros, and steering N.W. $\frac{1}{2}$ W. for 25 miles, then W. by N. $\frac{1}{2}$ N. for 39 miles, will pass outside all the cays, and will be 4 or 5 miles to the N. of the easternmost of the Holandes group. Great attention to the lead is, however, required, for it is suspected that many banks lie outside the cays.

The channels formed by these cays are named Pinos, Mosquitos, Kweeti, Zambogandi, Punta Brava, Cocos, Rio Monos, Ratones, Playon Grande, Puyadas, Arebalo, Mangles, Moron, Caobos, Holandes, Chichimè, and San Blas. Canal de Holandes is the largest: the least depth in it is 15 fathoms, on a sandy bottom, and its width is $2\frac{3}{4}$ miles. Its entrance is bounded on the S.W. by Icacos Cay, which is dry, and covered with high icacos (cocoa-plum) trees.*

The islets and cays of this archipelago present a most singular and beautiful appearance when viewed from sea, and the captains of the West India mail steamers plying between Carthagena and Aspinwall would afford their passengers a rich treat by running within sight of them.

GULF OF SAN BLAS.

Eighteen miles W. by S. $\frac{1}{2}$ S. of the easternmost cays of the

* *Crysobalanus icaco*, a tree belonging to the Crysobalanaceæ, a natural family allied to the Rosaceæ. It bears a pulpy fruit the size of a plum. The root, bark, and leaves are used medicinally.

Holandes group is San Blas Point, in lat. $9^{\circ} 34' 36''$, long. $79^{\circ} 0' 30''$. It is low, and skirted by a reef to the distance of $1\frac{3}{4}$ mile, on which are several cays, the easternmost called Cay Francés. In a S.W. and W. direction from Cay Francés there are twelve more islets, upon some of which are small fishing establishments; and to the E. of them are many banks and islands, forming part of the Mulatas archipelago, and having channels between them. Point San Blas forms the N.E. boundary of the Gulf of San Blas, the mouth of which extends N. and S. 6 miles, to the anchorage of Mandinga. From that line the gulf has a width of 6 miles to the W. Its shores are low, and bordered by mangroves. The anchorage of Mandinga and also that of Bahía Inglesa, or English Bay, in its S.W. part, are well sheltered, and have depth sufficient for any class of vessels. To run into the gulf, the most commodious passages are the Channel of Chichimè, 3 miles wide, and that of San Blas, $1\frac{3}{4}$ miles wide. Quite close to the Point, the Cordillera rises to the height of 2300 ft. This point is the boundary, on the Atlantic side, between the Isthmus of Darien and the Isthmus of Panama, and the settlements of the Darien Indians do not extend west of it.

DISTANCES.

	Miles.
From the most eastern mouth of the Atrato to Cape Tiburon .	46
Cape Tiburon to Point Escoces	19
Escoces Point to Sassardi Point	9
Sassardi Point to Cape San Blas	86
<hr/>	
Length of the Atlantic Coast of Darien	160

LATITUDES AND LONGITUDES.

	Lat. N.	Long. W.
Caribana Point	$8^{\circ} 37' 30''$	$76^{\circ} 52' 55''$
Turbo, on the E. side of the Gulf of Darien, due E. of the Caño Coquito mouth of the Atrato (Lieutenant Craven, 1858)	8 4 56.2	76 41 50.7
Cape Tiburon	8 41 30	77 21 30
Scorpion Cay, Caledonia Harbour (Parsons, 1854)	8 54 52	77 42 25
Cape San Blas	9 34 36	79 0 30

CURRENT.

Along the Atlantic coast of the Isthmus from Greytown a current is very sensibly felt, following the curvature of the land towards the Gulf of Darien. This easterly current extends from 20 to 30 miles from the land, and its rate is from 1 to 2

miles an hour. Close off the entrance of Portobello it runs from $1\frac{1}{2}$ to even 3 knots an hour in the rainy season. In Caledonia Harbour the tidal streams are overcome by a current which sets through the channel of Sassardi to the S.E., at about $\frac{1}{3}$ rd of a mile per hour.

SURVEYS.

The survey of the coast from the Atrato to the Chagres, by Captain Don Joaquin Francisco Fidalgo, was published by the Hydrographic Office at Madrid, in 1817. The Atrato had previously been surveyed by Don Vincente de Talledo y Rivera, and the coast from Carthagena to Venezuela by Captain Don Cosmè de Churruca. The charts of the harbours are contained in the Portoplano de las Antillas. In 1823, Lieutenant W. Ed. Fiott, R.N., visited the coast of the isthmus in the schooner *Renegade*, but does not appear to have made any survey. The coast near Chagres was surveyed, in 1828, by Captain H. Forster, of H.M.S. *Chanticleer*, who was drowned in 1831 in Chagres river. In 1854, Port Escoces, Caledonia Harbour, and the Channel of Sassardi were surveyed by Commander Parsons, of H.M.S. *Scorpion*. The longitudes on all the charts of the coast from the Atrato to Cape San Blas, except on that of Caledonia Harbour, by Parsons, are wrong, and a new survey is much wanted.

THE CORAL CAYS.

The coral of the cays and islands is exceedingly beautiful. When living in their natural element the various sorts of coral are covered with a gelatinous matter of the finest colours; and, looking out of a boat on a sunny day on the groves of coral, sea-fans, sponges, and polypi, with their brilliant colours dancing on the unsteady water, and gaudy fish gliding about among their branches, one can imagine himself looking through some brilliant kaleidoscope. Immense lobsters, conchs, and whelks the size of a man's fist are found in abundance at these coral cays, and also a huge crab about the size of a soup-plate, with a lovely pink shell spotted with white. Hermit crabs roam at night over these little islands, disturbing the weary boatmen by biting their toes and demolishing any food left in the pots; during the day they all disappear, being snugly hid under tufts of grass. In the quiet bays, protected by the coral reefs from the trembling breakers, flocks of grave pelicans sail about on the water, with their heads thrown back, and their long bills resting on their breasts, or tumble headlong from the air among the shoals of sprats, driving them in a silvery shower out of the water. The predaceous frigate-bird pursues the snowy sea-gull,

screaming round the cay, and amusing the spectator with its manœuvres to escape, till, wearied out, it lets fall the coveted fish, which is seized by the other before it reaches the water. Along the glaring sandy beach parties of snipes and sand-pipers scamper along in eager pursuit of their prey, which is washed up in the rolls of seaweed by the little waves. Now and then as a boat passes, yellow water-snakes will suddenly erect their heads and show their fangs with an angry hissing. Occasionally, shoals of grampus enliven the scene, splashing, leaping, and hunting one another with the greatest liveliness. The white circle of breakers on the reef, the dark blue sea outside, the calm bay with its back-ground of rich evergreen foliage, and the light feathery clouds drifting over with the steady trade wind, form a *coup d'œil* only to be imagined in the dark and stormy north.

THE PACIFIC COAST.

Inside Cruces Point, in lat. $6^{\circ} 32'$, is Cupica Bay, into which fall the rivers Cacique and Cupica. This harbour has deep water and is well sheltered, except from S. winds. Farther north is Cape Marzo, the Morro Quemado of Pizarro, a bold, bluff headland, which projects southwards and forms a bay, called Bahía Octavia, or Aguacate. Above Cape Marzo, the rivers Corredor, Paracuchichi, or Bocorochichi,* and Jurador, fall into a bay, called Puerto Quemado, the northern limit of which is Ardita Point. The mouth of the Paracuchichi was proposed as the terminus of the exploded Atrato and Truando canal route; and the Jurador was the river which Pizarro visited on his first expedition in search of Peru. It was called by the Indians, Biru; but he gave it the name of Rio de Hambre, or Hunger river, and called the natives Pueblo Quemado or burnt people. The misapplication of the name Biru which probably meant South, gave rise to that of Peru. All the way from Cape Marzo to Ardita Point, the beach is skirted with innumerable cocoa-nut trees. As these are found on the Darien coast, in places where no human beings or traces of them are to be seen, that would seem to be their native country. From Ardita to Cocalito and Piñas Points, the coast is bold and rocky.

Inside of Piñas Point is the little harbour of Puerto Piñas, which is very commodious and sheltered from the winds; but its entrance is narrow and obstructed by three small islands.

* Many Indian languages agree in the repetition of the same syllable in a word. Cocoraboora, Cabacaboora, and Chichirivichi, in the language of the Warrows of Essequibo and Venezuela; and Bellibellero, in that of the Caribs of Guiana, must here suffice for examples.

Its position is marked very distinctly by several detached rocks outside. It is $2\frac{1}{2}$ miles wide at its mouth, and extends inwards 5 miles. A small river, which is liable to sudden freshets, falls into it. It is closely hemmed in by mountains densely wooded, the land behind rising to a height of from 500 to 1000 ft., whilst the more distant ranges appear to reach an altitude of from 3000 to 5000 ft. This harbour used to afford a refuge to the pirates of the South Seas, and in it John Cliperton, who infested them at the beginning of the seventeenth century, careened his vessels.

Between Piñas and Garachiné Points are those of Caracoles and Escarpado. Near the latter is Puerto Escondido, or Hidden Harbour, very inaccessible, with a narrow entrance, through which there rushes a furious tidal current, causing a heavy swell and formidable surf.

Garachiné Point, the south point of the entrance of the Gulf of San Miguel, and the S. E. point of the Gulf of Panama, is bold and easily distinguished from sea. The tide runs $5\frac{1}{2}$ knots an hour off it, rises 3 fathoms, and ebbs and flows N. E. and S. W. There is very deep water off it, and inside of it is a large and well sheltered bay, where ships may careen.

In the Pacific, 15 miles true W. from it, is Trollope Rock, sunk 2 ft., and extending from $8^{\circ} 6'$ to $8^{\circ} 7' N.$, and from $78^{\circ} 37' 45''$ to $78^{\circ} 38' 15''$.

The temperature of this coast is from 84° to $86^{\circ} F.$ The rain-fall is very great, and heavy vapours hang over the heights. The depth of water all along it is considerable, being from 50 to 60 fathoms at a short distance from land.

All the coast from Cape Marzo to Garachiné is in Biruquete. The country below Garachiné was once inhabited by the Tarabes Indians, a tribe now extinct. At present, there are scarcely any inhabitants from Garachiné to Chirambirà, at the mouth of the San Juan. At Paracuchichi there are twelve huts widely scattered, inhabited by some samboes and negroes from Panama and a few Jamaica men who settled there some years ago. At Cupica there is a hamlet, the houses of which are built on poles, and reached by ladders. An Indian there styles himself Alcalde. At Ardita Point, which was visited by Dr. Seemann, in H.M.S. Herald, no people were visible, although there were some canoes on the beach; but two negroes and four Indians came off the next day with a white flag. One of the latter, who called himself Alcalde of Jurador, had a stick with a silver knob: all the party were naked.

The Gulf of San Miguel, the entrance of which is between Garachiné Point on the S., and Punta Brava, on the N., will be described hereafter.

THE GULF OF PANAMA.

The shore of the Gulf of Panama commences at Punta Brava, and runs thence in the shape of a bow to Punta Mala, the western point of its entrance, Garachiné being the eastern. This great inlet of the Pacific is 105 miles across at its entrance, and extends inwards 75 miles. Near its east side are the Pearl Islands, so that it has two passages for entering. Navigators prefer the western during the rainy, and the eastern in the dry season. The latter has, however, in its fair-way the disadvantage of the shoal of San José, in the middle of which Captain Kellett discovered a rocky patch with less than 3 ft. of water on it.* A very remarkable tree, towering above all the others on Galera Island, bears from it N. 57° 40' W. (true) distant 9 miles. The Gulf of Panama is remarkable for baffling winds, occasional squalls, frequent and long calms, rains more of a drizzling kind than those that fall on land, opposing currents, ripples, freshes, and a general disturbance and irregular motion of the surface-water, owing, probably, to the meeting in it of the cold current from the Peruvian coast with the great Equatorial counter-current. The author was thirteen days beating out of it in 1849, in the whaling brig, *Norman*, of Nantucket, Captain Gardiner, bound for San Francisco.

The Bay or Harbour of Panama, which is called Perico, is sheltered by the islands of Naos, Flamenco, Perico, Taboga, and Taboguilla. Ships of any burthen lie in it very safe under the lee of any of those islands, at the distance of $2\frac{1}{2}$ leagues from the shore. It is, however, ill adapted for a packet station, as vessels of even less than 300 tons have to lie 2 miles to seaward of the city, and are obliged to discharge their cargoes into flat-bottomed boats. Though the anchorage is secure, it has happened that all the ships lying there have been stranded. The tide rises and falls from 13 to 17 ft. at Panama. It is high water at Taboga, at full and change, at 3h. 16m. The greatest rise of tide there is 20 ft. Close to the shore at Panama are the Sulphur and Danäide rocks. Soon after the completion of the Panama Railroad, a pier, 450 ft. long, was constructed at the terminus, and steam-tugs were substituted for the lighters previously used for transportation between ship and shore.

CURRENTS.

During strong N. winds, the cold current which follows the direction of the coast of Peru, after passing Cape Blanco, sets over to the N.W. and W.N.W. towards the Galapagos Islands,

* Seemann, Dr. Berthold. Narrative of the Voyage of H.M.S. *Herald*. Reeve and Co.

and causes some singular effects there from its struggle with the warm waters of the Pacific. Near that Archipelago, the shores of which abound in animal life, and the tract of sea near which was the greatest whaling station in the Pacific, some remarkable veins of currents may be observed. Captain Fitzroy says that, when the *Beagle* was there in October, 1837, the surface water on one side of Albemarle Island was found to have a temperature of 80° F., whilst on the other it was less than 60°, a surprising difference in the Pacific, where the variations of temperature are usually within narrow limits. The temperature of this current being too low for the zoophytes explains the absence of coral reefs round the Galapagos. The current is not, however, at all times totally deflected at Cape Blanco; for it sometimes sets round the coast to the N. to the Pearl Islands, and affords great facilities for working up to the anchorage off Panama.

Between the parallels of 26° S. and 24° N. there is a current to the W., known as the great Equatorial current, embracing the whole tract of the Pacific from a little S. of the tropic of Capricorn to a little N. of the tropic of Cancer, with the exception of that between 5° and 10° N. In the latter space, which is the zone of the Equatorial calms between the trade winds, that extend across the entire breadth of the Pacific, there is a great belt of water having a current setting with considerable velocity to the E., towards the bight of the isthmus, and called by Mr. Findlay* the Equatorial Counter-current. Thus the current system seems to centre in the Gulf of Panama. The latter current and that from the coast of Peru, which set into the Gulf, probably find their way out round Punta Mala and along the coast of Veraguas, just as the current which sets into the Golden Horn of Constantinople from the Bosphorus runs out round Seraglio Point into the Sea of Marmora.

DISTANCES.

	Miles.
From Cruces Point, Cupica Bay, to Cape Marzo . . .	16
Corredor mouth	24
Paracuchichi do.	29
Jurador do.	35
Punta Piñas	70½
Caracoles Point	82
Escarpado do.	106
Garachinè do.	110
Punta Brava, round the shores of the Gulf of San Miguel	160
Chiman mouth	186
Chepo mouth	219
Panama	246

* Findlay, A. G., Esq. On Currents, Journal of the Royal Geographical Society, vol. xxiii.

LATITUDES AND LONGITUDES.

	Lat. N.		Long. W.		
Cape Marzo . . .	6°	50'	77°	40'	
Corredor mouth . . .	6	56			
Paracuchichi do. . .	7	2 30''	77	41	
Jurador do. . .	7	6	77	45	
Garachinè Point . . .	8	6	78	22 30''	
Chepillo Island . . .	8	59 40	79	7 40	
Panama . . .	8	56	79	31 2	

Variations of the Compass in 1848.

In Long. 78° W.	Lat. 4°	10' N.	7°	40' E.
”	5	10	7	35
”	6	15	7	30
81	7	10	7	40

SURVEYS.

A portion of this coast was surveyed from 1837 to 1839 by Sir Edward Belcher, in Her Majesty's ships *Sulphur* and *Starling*. The remainder was finished from 1846 to 1849 by Commander Wood, of the *Pandora*, and Captain Kellett, of the *Herald*, by whom the whole coast was explored from the San Juan to Punta Burica, the boundary between New Granada and Costa Rica.

THE DARIEN SHIP CANAL.

HISTORY OF THE PROJECT.

As the project of a ship canal across the Isthmus of Darien was brought before the public fifteen years ago, and then dropped, the first question that will be asked is, why has it lain in abeyance since then? It must be premised then, that, on his return from a journey to the Sierra Nevada of California, in 1849, Dr. Cullen examined the shores of the Gulf of Panama and the Gulf of San Miguel with the object of finding a practicable entrance for a ship canal, and, continuing his researches, entered the river Savana, and discovered the route about to be described. In spite of most formidable and appalling difficulties, he made a more particular examination of it in each of the three following years. In 1852, a short reconnaissance was made at each side by Messrs. Gisborne and Forde, whom Messrs. Fox and Henderson and Mr. Thomas Brassey had sent out. In 1853, in consequence of their favourable report, the Atlantic and Pacific Junction Company, of London, was formed. The directors were: Lord Wharnccliffe, chairman; J. Pemberton Heywood, Esq., deputy-chairman; J. S. Brownrigg, Ch.

Brownell, T. R. Crampton, E. Cropper, J. C. Ewart, G. D'Olier Gowan, W. I. Hamilton, Lewis H. Haslewood, H. T. Hope, Hugh Hornby, Admiral C. R. Moorsom, Captain Mackinnon, R.N., A. Montoya, His Excellency Francisco de Riveiro, His Excellency Ezequiel Rojas, Melvil Wilson, Alexander Wilson, Milner Gibson, M.P., and Baron Antoine Rothschild. The bankers were, Messrs. Heywood, Kennards, and Co.; the solicitors, Messrs. J. C. and H. Freshfield; the official auditor, J. E. Coleman, Esq.; the secretary, Dr. Black; and the engineer-in-chief, Lionel Gisborne, C.E. The offices were at 36, Moorgate Street, and 8, New Street, Spring Gardens.

Soon after the formation of the company, Dr. Cullen applied for permission to go out to Darien three months before the engineers, in order to clear a bush-path along the line, so that they might have room to carry their instruments; but his request was refused. He then applied on two occasions, but with equal ill success, for authority to act as guide to the exploring party, and to negotiate a treaty of friendship with the Indians.

In December, 1853, a large staff of engineers, most amply provided with money, instruments, and necessaries of all kinds, was sent out by the company to survey the line; and three British, a French, and an American ship of war were stationed in the harbours to assist them. However, very unfortunately for all concerned, *six weeks before their arrival on the coast of Darien*, Commander J. C. Provost landed on the Pacific side, and made an unsuccessful attempt to reach the Atlantic; and, *two days before their arrival*, Lieutenant Strain, U.S.N., landed in Caledonia Bay, on the Atlantic side, with the intention of crossing over to the Pacific. Thus, instead of a single well-arranged plan for making an impartial and thorough examination of the route, there were three unconnected explorations in different and wrong directions, of which two were conducted without the use of compasses! or even bush-knives!! and not one was brought to a conclusion. In each case, moreover, the commanders were guided by "volunteers," who were agents sent to offer their gratuitous services by the opposition company, namely, the Atlantic and Pacific Ship Canal Company, of New York, the promoters of which—F. M. Kelley, Esq., George Law, Vanderbilt, &c.—proposed to cut a canal by the Atrato route, which Humboldt had recommended on the authority of the Biscayan pilot, Gogueneche.

Thus, Commander Prevost was guided by Messrs. Kennish and Nelson,* and Lieutenant Strain by Messrs. Avery and

* Ross, Dr., H.M.S. *Virago*. Report of the Expedition sent to cross the Isthmus of Darien. From this Report, which was forwarded to the Director-General of the Medical Department of the Navy, and is published in "Over

Boggs, of the Atrato Company, and also by Messrs. Holcomb, Winthrop, Forster, and Bird, of the Panama Railroad Company.* Mr. Holcomb was the station-master at Aspinwall, Mr. Winthrop was nephew to Aspinwall, one of the contractors, and Mr. Forster was editor of the *Aspinwall Courier*—a newspaper supported by the Railroad Company. Lastly, Mr. Gisborne placed himself under the guidance of Colonel Augustin Codazzi, who, although in the service of the New Granada Government, as chief of the Chorographic Commission, was also father-in-law of Florentino Gonzales, a Doctor of Law, who, since the unfortunate fate of Señor Cardenas in the *Amazon*, was sole concessionaire of the Atrato route. Codazzi was likewise an engineer of the Atrato Company, and had just sent to New York a most favourable report of their line.

Although not one of the above gentlemen had ever before set foot on the Isthmus of Darien, and although Dr. Cullen accompanied Mr. Gisborne, yet, as the directors had refused to give him any authority or position in the conduct of the expedition which had been sent out to promote a project that had originated with him, he was not permitted to interfere in any manner whatever, and not only were his offers to act as guide rejected, but the course taken was directly opposite to that which he had pointed out.†

The result was that the engineer-in-chief, in his Report‡ to Lord Wharnccliffe, dated Her Majesty's ship *Espiegle*, Caledonia Harbour, April 4, 1854, stated that a tunnel 3 miles in length would be necessary, although the same Report concluded as follows: "I am quite aware that, in now concluding my surveying operations,§ there is a great deal of interesting information still wanting and that my examination of the Isthmus is not near so perfect as I had hoped to make it." This, indeed, had been so manifest, that Commander Parsons, of Her Majesty's surveying

Darien," a canal would seem to be practicable even along the line taken by Prevost—for Dr. Ross says that, from the highest point reached, estimated at 1200 to 1300 feet—"we overlooked a deep valley, densely wooded and running in an easterly direction. It was supposed that it was through this valley the Atlantic had been seen from the tree." The mountain they ascended was, perhaps, Putrigandi, and the valley may have been between it and Navagandi.

* Headley, Mr. J. T. Narrative of Strain's Expedition, in Harper's New York Magazine for March, April, and May, 1855.

† "Over Darien. Reports of the Mismanaged Daricn Expedition, with Suggestions for a Survey by Competent Engineers, and an Exploration by Parties with Compasses." London: Effingham Wilson, 1856. There is a copy in the British Museum.

‡ This Report was never published.

§ This can only be regarded as a grandiloquent euphuism, or *façon de parler*. There was no survey, nor even an exploration.

ship *Scorpion*, in a letter to Dr. Cullen, dated San Juan de Nicaragua, May 15, 1854, says, in allusion to Mr. Gisborne's opinion as to the necessity for a tunnel :—"Of course I shall not consider the matter thoroughly settled *until further search is made.*"*

The same opinion of the imperfect and partial character of the inspection of the country then made was expressed by Baron Humboldt, M. Malte-Brun, M. Michel Chevalier, and Mr. T. C. Vincent, of New Park-street, Southwark, who had spent several months in Bogotá examining the archives there in search of the accounts of the attempts made by the Spaniards to open a road across Darien.

More recently, I. Gerstenberg, Esq., F.R.G.S., in the discussion on Mr. Laurence Oliphant's paper "On the Bayano River," read before the Royal Geographical Society on the 24th of April, 1865, said : "The only route that I believe to be practicable is the Darien route. . . . Dr. Cullen and Commander Parsons have stated that there is a valley running through the main ridge to Caledonia Harbour. The only point to be settled is the existence of this valley, which subsequent explorers failed to find, *because they did not wish to find it*, owing, as I believe, to the jealousy of the Panama Railroad Company, and of the *Concessionnaires* of the Atrato route, who had rival interests, and consequently did not desire that the transverse valley should be found. In the hydrographical map of Parsons' 'Survey of Caledonia Harbour and Port Escoces,' he gives several views of the Cordillera ; and View 3 clearly shows that the Cordillera at that point is not an uninterrupted chain, but is broken into two separate and distinct ridges, between which a valley may naturally be expected."

The above-mentioned report, however, arriving just at the outbreak of the war in the Crimea, determined the directors to dissolve the company, returning the shareholders their deposits without any deduction. The project, in consequence, fell to the ground, and has lain in abeyance ever since.

It will be found, nevertheless, upon a survey being made by competent engineers, sincerely desirous of the success of the project, that, by following the course laid down in this paper, the necessity for a tunnel can be avoided.

THE ATLANTIC HARBOURS.

As it would not be practicable at all times to sail into a canal direct from the open sea, safe anchorage must first be obtained

* Letters on the Darien Canal. London : Effingham Wilson, 1857.

very near its entrance, and that opening must itself be perfectly protected not only from injury from land floods, but from the effects of storms, from the surf and heavy swell of the sea, and from any accumulation of sand, mud, or shingle. Delays, dangers, difficulties, and expense would be the consequences of using a canal not provided with the adjunct of a good harbour at each end, and such a canal would not answer the requirements of commerce. For any line, therefore, by which it may be proposed to effect the junction of the two oceans, the *sine quâ non*, the preliminary and indispensable requisite, is that it should have at each terminus a good harbour, capable of affording secure anchorage at all times, in both the dry and the rainy season, safe and sheltered from all winds, having sufficient capacity and depth of water, and easy of ingress and egress. The following description will, perhaps, be sufficient to prove that the Darien route is adequately provided with secure harbours at each end.

On the Atlantic coast a series of good anchorages extends continuously for 12 nautical miles from S.E. to N.W., namely, Port Escoces, $2\frac{1}{4}$; Caledonia Bay, $3\frac{1}{2}$; Caledonia Harbour, $2\frac{1}{2}$; and the Channel of Sassardi, $3\frac{3}{4}$ miles in length. All these have great depth of water, the least being 6 fathoms. They are so extensive and (with the exception of Caledonia Bay, which is an open roadstead) so perfectly sheltered that whole fleets might ride safely in them.

PORT ESCOCES is a noble harbour, with from 6 to 9 fathoms of water over a bottom of sand, except in its innermost part, where the water shoals to 3 fathoms. It extends inwards $2\frac{1}{4}$ miles, with a breadth of from $\frac{1}{4}$ to $\frac{1}{2}$ a mile. It is very safe, being protected from the winds and waves by a promontory, on the inner side of which the Scotch colonists built the town of New Edinburgh and the fort of St. Andrew. The summit of the promontory is 580 ft. high, and the hill at its point 260 ft. Both are covered with forest. The latter was named Patterson Hill by Parsons, as it was from its top the colonists were accustomed to look over the sea in the evening, in the direction of Scotland. The author was the first to point out the site of the settlement, and in 1854 brought Dr. McDermott, of H.M.S. *Espiegle*, to search for the canal that the colonists dug round the fort, but it was dark when they reached the place. Dr. McDermott afterwards returned with Commander Parsons, and they found the canal quite perfect. It is 130 paces in length, cut angularly as a fortification, and has an embankment on the inner side. Its north entry, 8 ft. deep and 12 ft. wide, is cut through rock. They dug into several mounds, having the appearance of graves, but could find nothing : these may have

been heaps from the ruins of houses, and the cemetery may have been at some distance from the fort. They could find no guns; probably these were removed by the Spaniards, and now, perhaps, help to form the barrier round Fort San José, at Carthagena.

Several rivulets fall into Port Escoces, and offer facilities for watering. Their water, and that of the rivers of Darien in general, is clear, cool, sparkling, and delicious.

The entrance into CALEDONIA BAY is between Point Escoces and Isla del Oro or Golden Island, which bears from the former N. 40° W., distant 4 miles. From this line it falls inward $1\frac{2}{3}$ mile. It is clean, and has great depth of water. The greater part of its shore is a beach, near the middle of which disembogue the rivers Aglaseniqua* and Aglatumati.

Point Escoces is 7 miles N.W. $\frac{3}{4}$ W. (N. 48° W.) of the point at the entrance of Carreto Harbour.

Golden Island is wooded to the summit, which is 470 ft. high, and has a cliffy appearance at the base and sides. It has a rivulet of clear water and a landing place at the south side. Lionel Wafer, the surgeon of the Buccaneers, and Captain Barty Sharp stopped on it for fifteen days in the year 1680. About $1\frac{1}{2}$ mile S. of Golden Island is a smaller one, named San Augustin or Ascension, on which there is a large space covered with a mass of bricks and tiles, the ruins of a magazine which the Spaniards built in 1785, and from which it derives its Indian name of Kinki Topoo or gunpowder island. It is interesting as being the place where the treaty of peace between the Spaniards and Indians was signed on June the 9th, 1787. It was cleared in 1854 by Captain Hollins, of the U.S. corvette, *Cyane*, to receive the jackasses which Lieutenant Strain, U.S.N. had brought down from New York, under the erroneous impression that there was a road across Darien, by which his party could ride over to the Pacific! Rather more than a cable's length south of San Augustin is Piedras Islet, so named from the rocks close to its shores.

In Caledonia Harbour, between San Augustin and the three large Sassardi Islands, which are to the N.W., are Dobbin Cay, Espiegle, Cyane, and Chimere Islands, and Scorpion Cay. The four last were named by Parsons after the vessels of war that were engaged on the Darien expedition.

The AGLATUMATI RIVER has a course of about 12 miles from S.E. to N.W. Its mouth is about 50 ft. wide, and has a bar with very little water on it, but inside there is a depth of 8 ft. About a mile up it is shallow enough in the dry season for

* *Agla* is the name of the mountain in which they rise; *seniqua* means "little," and *tumati* "big." *Agla* signifies "bones of men."

one to wade along it knee deep; but in the rainy season the depth is considerable and the current very strong, and during floods it rushes along with great impetuosity and a roaring noise. At its mouth there are five bamboo huts, in one of which an old Indian, whose adopted name was Robinson, resided in 1850. On the arrival of the expedition the Indians abandoned them, and they were occupied by some of the New Granadian soldiers and convicts brought from Carthagena by Colonel Codazzi, who kept them there in a state of total inaction. About three miles up the Aglatumati receives a large tributary (the Chucurti) on the left hand side, and on the point between them there is a rancho or shed for Indians going to or from the Sucubti or the Chueti to rest at. About two miles higher up it is joined by a small stream on the right hand, on the further bank of which is the village of Agla, consisting of about eighteen huts, with a population of about sixty. It had just been abandoned when Mr. Gisborne and party arrived there, the Indians having fled through fear of the white men. The principal man of the place was Juan Sevà, named after a Malaga man, who traded for twenty-eight years from Carthagena to the Darien coast, but was so much afraid of the Indians that he never once landed on it. On the lower bank of the above stream (Dos Bocas) there is a cacao plantation, from which a trail leads for about 300 yards to the foot of Mount Agla, which rises quite suddenly. Its summit is 926 ft. high, and very narrow, and the ascent to it is rather steep. The descent is more gradual on the other side to its foot, where the Foreti unites with the Sucubti, the waters of which flow into the Pacific. This is the trail by which the Indians cross the Cordillera from Caledonia Bay to Sucubti village; by which they guided Vasco Nuñez in 1513, the Buccaneers in 1680, and the Spanish Adjutant, Manuel de Milla Santa Ella in 1788. It was by the same trail that Lieutenant Strain crossed on the 23rd of January, and Mr. Gisborne, on the 7th of February, 1854, and it was through Mount Agla that Mr. Gisborne reported that a tunnel would be necessary. But this is not the line that had been proposed by Dr. Cullen, which, as will be explained, is some miles to the N.W. of the trail.

At the mouth of the Aglatumati, from whence Vasco Nuñez had started on his memorable journey, the settlement of Acla or Agla was founded by Gabriel de Rojas in 1514. It was fortified in 1516 by the orders of Pedrarias Davila, but was abandoned in 1532 for Nombre de Dios, whence the Spaniards opened a road through the bush to Panama. After Drake's expedition, the Atlantic terminus of the transit route was removed to Portobello, which was given up for Chagres, and that, in

turn, for Aspinwall or Colón, the terminus of the Panama Railroad. The Buccaneers, in 1680, under Basil Ringrose, Barty Sharp, William Dampier, and Richard Sawkins, with whom was the surgeon, Lionel Wafer, of London, made the Aglatumati mouth* the starting point of their expedition to the South Sea. The same place was afterwards selected by General Arebalo for the erection of the fort of San Fernando de Carolina, built in 1785 and abandoned in 1790, the site of which is indicated by a grove of cocoa-nut trees, and some tiles and bricks. A large quantity of the latter was once brought to Carthagena by Juan Sevà, whose father-in-law built a house with them.

The Aglaseniqua is 20 ft. wide at its mouth, which has a bar with only 2 ft. of water on it. Inside, the depth is 8 ft. and half a mile up 5 ft. Its course from the mountain is short and direct, and it is totally uninhabited. Both this river and the Aglatumati were traced up to their sources by different parties, in the vain expectation of finding a low pass from them across the Cordillera.

CALEDONIA HARBOUR, a most secure haven, extends from a line drawn between Golden Island, Piedras Islet, and San Fulgencio Point to the Mangrove Cays to the west. Its S.E. entrance is off and on, with four cables' length in extent from edge to edge, and with from 9 to 12 fathoms depth on oaze; and further in, from 8 to 10 fathoms. Between the turn of the bank off Piedras Islet and Caledonia Bay, the depth is from 7 to 15 fathoms; and the piece of sea which intervenes between this harbour and Port Escoces is of a good depth; but at a short mile S.E. by E. $\frac{1}{2}$ E. (S. 55° E.) from Piedras Islet the sea breaks when the breeze blows fresh. This harbour is sheltered from the winds and seas of both seasons, and has good depth throughout. It is $\frac{3}{4}$ of a mile wide, and $2\frac{1}{2}$ miles in extent to a narrow bar which separates it from Sassardi Channel.

The point of San Fulgencio is salient, scarped, and clean. Immediately behind it rises an isolated hill, 200 ft. high, which Parsons named Mount Vernon. Just inland of it Captain Hollins bored a well through a stratum of dolomite or magnesian limestone.

Immediately inside, or to the N.W. of San Fulgencio Point, is an indent or little bay which falls inwards half a mile from a line drawn between San Fulgencio and its western point, and is a mile in length from S.E. to N.W. Its western side is bordered by some mangrove cays. This haven is so "snug" that it would be the most eligible place for the entrance of the canal. To adapt it for the passage of ships, it would be necessary to

* In 1764, some Frenchmen settled there, but were soon afterwards massacred by the Indians.

remove a few little shoals, and to deepen it to 30 ft. for a quarter of a mile from the shore, in which space it has only from 12 to 24 ft. of water. Immediately westward of it, however, the depth close in shore is much greater. The inner part of its western extremity is in Lat. $8^{\circ} 53' 45''$ N., Lon. $77^{\circ} 43' 30''$ W.

At the N.W. end of Caledonia Harbour, $2\frac{3}{4}$ miles N.W. of Fulgencio Point, and in a line with the bar which separates it from the channel of Sassardi, a considerable river, with 8 ft. of water at its mouth, falls into the harbour. This river traverses the valley between Agla and Sassardi, the parallel mountains of which the Cordillera, inland of Caledonia Harbour, consists. The water-shed between it and the Sucubti is the lowest summit level between the oceans, and therefore, the careful examination of this river will be of the utmost importance in the survey about to be made.

Captain Marivault, of the French frigate, *Lucifer*, who visited Caledonia Harbour in 1860, says of it: "This harbour is magnificent, and no one could desire a better point for the entrance of a ship canal. To the north of San Fulgencio Point the sea is perfectly calm."

The CHANNEL OF SASSARDI is between the mainland and the three Sassardi islands, the aggregate length of which is $3\frac{3}{4}$ miles. Its entrance, $\frac{3}{4}$ of a mile wide, is between the point of the N.W. island and the Fronton of Sassardi. The latter is a round, scarped promontory surrounded by reefs close to the shore. The total length of the channel from the bar between it and Caledonia Harbour to its N.W. end is $3\frac{3}{4}$ miles. Commander Parsons says, in his "Sailing Directions:"—"Sassardi Harbour is a fine sheet of water, being $1\frac{1}{2}$ mile long and $\frac{3}{4}$ of a mile wide, with an average depth of 6 fathoms throughout, excepting a few shoals nearly awash. It is joined to Caledonia Harbour by a narrow bar of 12 ft. This Mr. Gisborne bored, and found it could be easily removed, having penetrated into marl 15 ft. If cut through it would make a clear communication, with the advantage of a double entry to the harbour." Into its N.W. extremity falls the small river Sassardi, at the mouth of which is the village of the same name, consisting of fifteen huts, with a population of about sixty Indians, the chief of whom was formerly a very old man, named John Bull, who was succeeded by Denis; the latter as before stated, died in 1861. Between it and the river of Caledonia Harbour, two other streams fall into the channel, one of them being from 6 to 10 ft. deep at its mouth, the water in which is salt.

The engineer will have a wide scope for selecting a locality for the entrance of the canal, which may open anywhere in Caledonia Harbour or the channel of Sassardi. Parsons says:

"There are several points which are favourable for the entry of a ship canal, having deep water in close proximity to the shore, with protection outside." That which Dr. Cullen recommends is the bight N.W. of San Fulgencio Point. In Caledonia Bay, and Port Escoces, there are also several points with from 6 to 9 fathoms, so near the shore that vessels might lie there as close to the land as they can in the Bosphorus; but they are out of the way and not sufficiently protected.

The rise of tide in the Atlantic harbour is 1 ft. 6 in. springs, 0 ft. 6 in. neaps. High water, full and change 11 h. 40 m.

PACIFIC HARBOURS.—THE GULF OF SAN MIGUEL.

The harbours on the Pacific are even superior to those on the Atlantic side. The outer one is the magnificent Gulf of San Miguel, which is peculiarly adapted by its position and natural advantages to afford a safe and noble approach to the future canal. It runs far inland, has great depth, and capacity sufficient for a large fleet. Its entrance is just outside the Gulf of Panama, a great advantage, since ships bound to or from the Pacific would entirely avoid the difficult and baffling navigation of that gulf, already alluded to. It is 15 miles across between the points at its entrance, and its extent inwards, or to the N.E., is 22 miles. The least depth is 6 fathoms, and throughout the greatest part of its extent the soundings vary from 8 to 17 fathoms. The tide rises in it from 18 to 24 ft., runs 5 knots an hour, and ebbs and flows N.E. and S.W. It is bounded on the N. by a promontory 2 miles from E. to W., the inner point being Cape San Lorenzo, and the west or outer one, Punta Brava, which is 78 miles S.E. by E. $\frac{1}{2}$ E. of Panama. One mile S. of it is a shoal, called El Buey (the ox), which is $1\frac{1}{4}$ mile broad and $\frac{1}{2}$ a mile long, with 6 fathoms close to it. Though out of the track of vessels, this should be removed as soon as the works on the canal shall have commenced. The boundary of the entrance on the S. is Cape Garachiné, a bold headland, easily distinguishable from sea. Inside of it there is a bay of the same name, which offers facilities for careening; and behind it rises Mount Garachiné, about 2500 ft. high, said to be rich in *oro de veta*, or gold in veins. The village of Garachiné, inhabited by 162 negroes, is at the mouth of a little river in the bay. At the inner end of the latter the shores of the gulf approach, its width diminishing to 7 miles between Cape San Lorenzo and Morro Patiño. It then increases to 12 miles, and again diminishes as far as Boca Chica and Boca Grande, the mouths of the Tuyra, the principal river of Darien. These discharge themselves, 22 miles from its entrance, into its eastern extremity,

which is a bay formed by the islands of San Diego, and called Boca de Provincia, or Ensenada del Darien. There are some islands in the gulf, as Iguana, Cedros, San Diego, &c.; but they are all safe of approach, and have deep water all round them. The rivers Congo, Sucio, and another tidal creek, Cucunati, Cupunati, Buenavista, Escudero, and San Miguel fall into it on the N.; the Guaca, Taimita, Sambu, Pinuguilla, Garachinè, and San Antonio, into Garachinè Bay; and the Moguey and Sosogana, into Playa Guadarrá, a bay inside of Morro Patiño, on the S.; whilst the Tuyra opens into it on the E. On the Sambu, at the sources of which gold has been found, there was a hacienda or estate belonging to Señor Bermudez, of Panama. At Taimita mouth there lived some years ago, like a hermit, a white man from Venezuela, named Fernando Melo. These and Garachinè village are the only inhabited places. The Congo is the river which Wafer ascended on his return in 1681. From it Lacenta, the Indian chief, guided him to the Chepo, and thence across a very lofty range of the Cordillera to the mouth of the Concepcion, near San Blas Bay, and 60 miles N.W. of Caledonia Harbour. This gulf was named San Miguel by Vasco Nuñez, because he discovered it on St. Michael's day, the 29th of September, 1513.

THE ESTUARY OF THE TUYRA OR INNER HARBOUR OF DARIEN.

Inside the mouths of the Tuyra is the estuary formed by the united streams of the Tuyra and the Savana, which falls into it from the N. It is 8 miles in length, 4 miles wide opposite the Savana mouth, and has a depth of 13 fathoms at low water. Boca Chica and Boca Grande, by which it discharges itself, have each a depth of 12 fathoms at low water. This inner harbour is perfectly landlocked. The Emperor of the French, at the author's last audience with him, at the Palace of St. Cloud, on the 30th of October, 1859, was much struck with its advantageous position and security, and suggested that it should be named "Port Interieur du Darien." Boca Chica Island, which separates the mouths, is a round, conical hill, about 250 ft. high, wooded to the summit, on which there are the ruins of a fort built about 1788. In 1849, Fernando, or Manchakala, a negro who left Pinogana in consequence of Mr. Hossack's claiming all his services in payment of a debt, settled on it with his sons and grandchildren, being there out of the reach of the corregidor. On the N. bank of the Tuyra, near the E. point of the Savana mouth, there was once a settlement called Escuchadero (the

listening place or the sentinel's post). The scenery of the banks of the estuary is magnificent.

The above details will, perhaps, be sufficient to prove that the harbours at each end of the line have all the requisites of safe anchorages—security, depth of water, capacity, and facility of ingress and egress, and that they are admirably adapted for the termini of a grand interoceanic navigation. The soundings, bearings, &c., will be found in the “Survey of Caledonia Harbour and Port Escocés,”* with sailing directions accompanying, by Commander Parsons, of H. M. Surveying Ship, *Scorpion*; and the “Survey of the Gulf of San Miguel,” by Captain Kellett, of H.M.S. *Herald*, in Sheet 1, West Coast, Central America, both published by the Hydrographic office of the Admiralty, in 1854.

THE SAVANA RIVER.

Three miles above the mouths of the Tuyra is the W. point of the river Savana, or Chapurti, which opens into the estuary. From thence to Nisperal,† the E. point, the width of its mouth is 2 miles. The depth there is 12 fathoms at low water, and the rise of tide is considerable; the W. point, about 500 ft. high, is bold and bluff; the E. point is low. The Savana is a noble river, remarkable for the directness of its course from its mouth up to the confluence of the Lara with it, a distance of 16 English miles. Up to that point it is quite free from sand-banks, rocks, shoals, playas or sandy beaches, sinuosities, sudden bends, deep elbows, snags, or obstructions of any kind. Its banks, elevated several feet above the water, are never inundated or swampy. The endemic remittent and intermittent fevers, which are caused by the malarious miasmata from drowned lands, would, therefore, not be likely to occur in any settlements that may be established on its banks. It must not be inferred that the Isthmus of Darien is unhealthy, because Portobello, Chagres, and Aspinwall, the only frequented places on the Isthmus of Panama, are sickly. Those towns are built on swampy ground backed by mountains, in a most unfavourable situation in a sanitary point of view, their convenience for commerce having been exclusively considered in the selection of their sites. A convincing and most agreeable proof of the freedom of the banks of the Savana from swamp is the total absence of mos-

* To be had at Stanford's, in Charing Cross; or Potter's, in the Poultry, price 2s. 6d.

† Nisperal signifies an orchard of nispero or sapodillo trees (*Sapota achras*, Sapotaceæ). The nispero, a delicious fruit, although commonly called a medlar, is quite unlike the English medlar.

quitoes, insects which invariably swarm wherever the ground is marshy.

A range of hills, about 500 ft. high, runs parallel to each bank for nearly 15 miles up. The plain on each side between the hills and the river is 2 or 3 miles wide, except near its mouth, where they approach the W. bank much nearer, and terminate a bluff behind the point; whilst on the E. side they recede farther off. Just below the mouth of the Lara, and above a wide part of the river, called *Revesa de Piriaki*, that near the E. bank terminates in *Cerro Piriaki*, an isolated, conical hill, about 300 ft. high. Above it there is no hill near either bank.

The country on both sides is totally uninhabited; nevertheless, most of the places have Indian names: thus the *Savana* is called *Chapurti*, the W. Point, *Pacomalica*, &c.

The first reach, 7 miles in length, from its mouth to the junction of the *Areti* with it, has a width of $1\frac{1}{2}$ mile. Its direction is N. true. The depth in it gradually diminishes from 12 to 7 fathoms. A little above the mouth, on the W. bank, is *Punta Machete*, which has the small shoal of *Bajo Grande* above it, and that of *Bajo Chico* below it. Both are quite close to the bank and have beds of oysters on them. Fresh water may be obtained in the driest season from the *Quebradas Lagradilla* and *La Monera*, which open on the W. bank. The *Iglesias* falls into this reach from the E., and fresh water may be procured in both seasons from *Quebrada de Tigre*, one of its tributaries. Along the N. bank of the *Iglesias* there is a ridge of hills, the *Cerro Fichichi*, on the extremity of which, near the angle between the *Tuyra* and the *Chuquanaqua*, there was once a settlement, which was abandoned years ago; the last survivor of its former inhabitants was a negro named *Marcellino*.

The second reach has several islands in it, which are all safe of approach. It extends from the *Areti* mouth to the most northern of the islands, 3 miles in a N.N.W. direction. Its average width is about 1 mile, and its depth 6 fathoms. The *Areti* is a large stream, and rises in the *Fichichi* range. Opposite its mouth, *Zuñiga*, a negro from *Chapigana*, squatted in 1850, and called his place *Quintin*; but the total absence of society soon obliged him to quit it. The principal branch of the *Areti* is the *Tinti*.

The third, *Calle Larga*, or long reach, which extends from the most northern island to the mouth of the *Lara*, is 6 miles in length, and has a N.N.W. course. It is very direct, not having the slightest bend. The water shoals in it from 6 to 5 fathoms, which is the depth at the mouth of the *Lara*, where there is a rise of tide of 12 ft. or 14 ft. *Corotu*, an *estero*, or creek, into

which the tide flows, Corredor, and other streams, open on its W. bank. The journey from the Savana mouth to the confluence of the Lara can be made with the tide in two hours.

Two miles above the Lara, but on the W., or opposite, bank, is the mouth of the Matumaganti. Half a mile above it a large quipo tree stands conspicuous on the W. bank, towering above the adjacent forest. Half a mile higher up a patch of dense, scrubby brushwood, without trees, indicates the site of Fuerte del Principe, or Puerto Principe, a military post established by the Spaniards in 1785, with the object of making a road across the isthmus, from thence to the fort of Carolina, in Caledonia Bay. But the Indians of the Atlantic coast opposed the project, and the forts were abandoned in 1790, as appears from a despatch from Don Francisco Ayala, Governor *ad interim* of Darien, dated Chapigana, Oct. 17, 1790, in which he says he left Principe the day before, having demolished the establishment, even the nails of which he took away, and brought off the artillery, ammunition, cattle, &c. This despatch was forwarded by Joseph Domas y Vallez, the Governor of Panama, to Antonio Caballero y Gongora, the Viceroy and Archbishop of New Granada, at Bogotá. The fort was built on a tongue of land between the Ocubti and the Principe, which open on the W. bank of the Savana. The only remains to be found are some fragments of botijas, or water-jars. In 1851 there were at Yavisa three negroes, named Mascareño, Pedro Louriano Galvez, and Lere, who were born at Principe, where their fathers were soldiers. Mascareño was nearly five years old when it was abandoned. They said that the garrison, consisting of 150 men, went from thence to Yavisa, and that there were occasionally as many as 400 men at Principe. They also stated that the evening gun fired at Carolina could be heard at Principe. The only thing which the Spaniards effected during their stay was the opening of a bush-path from Yzquinti, the upper branch of the Savana, to Yzquinti, a branch of the Chuquanaqua, which was done by Don Luis Carrera, Captain of Grenadiers of La Princesa, a regiment of European Spaniards, who was also commandant of the fort. He was assisted by Don Juan Ximenes Donoso, Captain of Engineers; and the work was done by the directions of Lieutenant-Colonel Don Andres de Ariza, Governor of Darien. It was by this path that Sergeant Gabriel Morales returned from his unsuccessful expedition in search of Indians, in 1786. The only Spaniard who crossed the Isthmus during the occupation of the forts was the adjutant, Don Manuel de Milla Santa Ella, who went across in 3 days' walk from Carolina to Principe, in 1788, guided by a Sucubti man, and under

the safe conduct of Suspani, or Urruchurchu, the Chief of Sucubti. Finding that he had been tracked by hostile Indians to the precincts of the fort, he did not deem it prudent to return the same way, but went back *viâ* Panama and Portobello. No second attempt was made.

From Lara mouth to Principe the course is nearly N., and the river becomes somewhat tortuous, with some islets separated by deep channels. At Principe the depth is 3 fathoms, and the rise of tide about 6 ft. The river is crossed there by a ledge of slate, visible when the water is low. Two miles above Principe, on the W. bank, is the mouth of La Villa. A little higher up, on the opposite bank, a rivulet falls into the Savana; by the side of it there was once a path, called Camino de Caobana (the road of the mahogany tree), which was, probably, made by the Spaniards for the purpose of hauling out mahogany. About $\frac{1}{2}$ a mile higher up the river is obstructed by ledges of a slate or coarse argillaceous schist, called pizarra in Spain, and killas in Cornwall, which cross it diagonally at several points for a considerable distance up. Between these ledges there are reaches with great depth and a slack current. The tide reaches up to the first falls caused by them, or about 22 miles above the Savana mouth, but only flows for $\frac{1}{2}$ an hour. About 2 miles above La Villa, also on the W. bank, is the mouth of the Cañasas, so named from a thorny species of bamboo, of which there are impenetrable thickets in the vicinity. About a century ago, when the Indians were more numerous, there was a trail from thence to the Cañasas, a branch of the upper Chepo, by which hunters used to pass in three days. Canoes can go up the Savana for 2 days' journey to the N. of the Cañasas. From its head stream, Yzquinti, to a river of the same name, which flows from S.W. to N.E. into the Chaquanaqua, the distance is only 3 miles.

In fine, there is an easy and uninterrupted navigation for vessels of the greatest draught of water all the way from the confluence of the Lara with the Savana to the Pacific Ocean. It is, then, into the Lara, at or above its mouth, that the Pacific entrance of the future canal should open.

THE LINE.

Premising that, as already stated, the whole isthmus is covered throughout with a dense primeval forest, extending from the summits of the highest mountains to the very edge of the sea, and broken only by the courses of the rivers, which are very numerous, the line from Caledonia Harbour to the mouth of the

Lara may be divided into six parts, which, with the mean courses by compass, and the distances in English miles between the principal points are as follows :

1. The line crosses a plain extending from the S.W. extremity of the bight in Caledonia Harbour to the entrance of a valley between Agla Mountain, on the S.E. and Sassardi Mountain, on the N.W.—2 miles S. by W. $\frac{1}{4}$ W. (S.S.W. true.)

2. Through the valley, $3\frac{1}{2}$ miles S.E. by S. $\frac{1}{4}$ S. (S.S.E. true.) On the way the line strikes upon the head of the Sucubti.

3. Down the Sucubti to the site of the abandoned hamlet, $2\frac{1}{2}$ miles, S. $\frac{3}{4}$ E. (S. true.) Canoes can come up to the hamlet, and even a couple of miles above it, and can descend from thence to the Pacific, *via* the Chuquanaqua and the Tuyra.

4. From the hamlet down the bed of the river to the confluence of the Asnati with it, 7 miles W.S.W. (W. by S. $\frac{1}{4}$ S. true.) In this stage the Napsati falls into the Sucubti, $2\frac{1}{2}$ miles above the Asnati.

5. From the Asnati mouth the line continues to follow the Sucubti down to its confluence with the Chuquanaqua, on the E. bank of which it opens— $11\frac{1}{2}$ miles, W. $\frac{3}{4}$ N. (W. by N. $\frac{1}{2}$ N. true.)

6. From the W. bank of the Chuquanaqua, opposite the Sucubti mouth, and below the Artuganti and La Paz mouths, to the confluence of the Lara with the Savana, it traverses the forest for the distance of $15\frac{1}{2}$ miles S.W. by W. $\frac{1}{4}$ W. (W.S.W. true.)

The length of the line is 42 English miles, from which at least 3 may be deducted for the windings of the Sucubti, which would be cut across. It runs for $21\frac{1}{2}$ miles along the bed of that river, the lower 12 of which are pretty direct, and would admit of being canalised by means of dams and embankments, for a moderate outlay, leaving 27 miles for the length of canal required. The entire transit route from sea to sea will then consist of—

	English Miles.
Canal	27
Canalised River	12
Navigation of the Savanna	16
Navigation of the Tuyra	3
	<hr/> 58

This distance could be easily traversed in 24 hours, even making allowance for the time that would be occupied in the passage of the locks.

The S.W. end of the bight being in Lat. $8^{\circ} 53' 45''$ and Long. $77^{\circ} 43' 30''$, and the mouth of the Lara being in Lat.

$8^{\circ} 41' 45''$ and Long. $78^{\circ} 7'$, the distance between them in a direct line is 26 geographical, or $30\frac{1}{8}$ English miles, and the course is S. 62° W. (S.W. by W. $\frac{1}{2}$ W. true), or S.W. $\frac{3}{4}$ W. by compass, allowing $\frac{3}{4}$ of a point for the variation, which was $8^{\circ} 50' E.$ in 1854. The variation is increasing at the rate of, probably, $\frac{1}{4}$ of a minute each year, and may now be assumed to be $8^{\circ} 53' E.$

As the tide of the Pacific rises $6\frac{1}{2}$ ft. at the bifurcation of the Lara ($3\frac{3}{4}$ miles above its mouth), and that point is less than 28 English miles from Caledonia Harbour, the length of canal required would be lessened by two miles by cutting into the river at its bifurcation, and dredging it from thence to the Savana.

The following are the latitudes and longitudes of the principal points :

	Lat. N.			Long. W.		
Escoces Point	8°	$51'$	$22''$	77°	$38'$	$30''$
Golden Island, N.E. Point	8	54	20	77	40	50
Fronton of Sassari	8	58	4	77	45	0
San Fulgencio Point	8	53	37	77	42	15
S. W. end of the Bight of Caledonia) Harbour, N. W. of St. Fulgencio) Point	8	53	45	77	43	30
Entrance of Valley	8	52	7	77	44	15
Sucubti Hamlet, site of	8	47	30	77	43	45
Asnati mouth	8	46	0	77	49	0
Sucubti mouth	8	48	30	77	57	45
Lara do.	8	41	45	78	7	0
Savana do. (W. Point)	8	28	30	78	5	0
Tuyra do. (Boca Chica)	8	28	45	78	8	0
Punta Brava (Gulf of San Miguel)	8	20	30	78	24	15
Garachiné Point (ditto)	8	6	0	78	22	30

Punta Brava is 78 miles S.E. by E. $\frac{1}{2}$ E. of Panama; and San Fulgencio Point is 135 miles E. by S. of Aspinwall or Colón, in Navy Bay, the Atlantic terminus of the Panama Railroad. The line is from 60 to 80 miles E. of the boundary line between the Isthmus of Darien and the Isthmus of Panama, which runs from the Chepo or Bayano, in the Gulf of Panama, to Mandinga or San Blas Bay, and along its shore to Cape San Blas, and corresponds very nearly to the meridian of 79° W.

LEVELS.

The Cordillera, inland of that part of the coast between Sassari Point and Carreto Harbour, consists of three distinct ranges, which run parallel to the coast, or S.E. and N.W. The first commences close to the shore of Port Escoces, and runs S.E. behind Carreto. The second, named Agla, begins at San Fulgencio Point, and becomes continuous with the first behind

Carreto, forming, at the point of junction, an elevated rounded summit, called Loma Descada. Between them is enclosed the deep and wide valley in which the Aglatumati and Aglaseniqua have their courses. This valley being closed up at its head by the junction of the two ranges, there is no pass from it, and a canal from it to the Sucubti, on the Pacific side of the Cordillera, would not be practicable, except by tunnelling through Mount Agla, the base of which is 3 miles broad. This valley opens into Caledonia Bay, and not into Caledonia Harbour, and is 3 miles S.E. of the line: it should, therefore, be avoided. The third range is Sassardi Mountain, which commences inland of the N.W. extremity of the latter, and runs thence N.W., terminating abruptly a little west of Sassardi Point. Between its N.W. end and Navagandi Mountain there is a complete break in the Cordillera. Through this there may, perhaps, be a low pass from Sassardi River to the Moreti, which falls into the Chuquanaqua 7 miles N. of the Sucubti. Its S.E. extremity being overlapped by the N.W. end of Agla, and both being covered with a dense forest, the two ranges appear as one to a careless observer; but View 3 on Parsons' Chart shows very clearly that they are distinct and unconnected.

The height of Sassardi, $3\frac{3}{4}$ miles W. by S. of San Fulgencio, is 1985 ft. It falls to 710 ft., $2\frac{1}{4}$ miles S.E. of that summit. In the next $\frac{2}{3}$ of a mile it rises to 1275 ft., and then suddenly sinks down to the level of the valley between it and Agla. The Peak of Agla, on the other side of the valley, is 926 ft. high; it bears from the 1275 ft. summit of Sassardi E., and the horizontal distance between them is $1\frac{1}{2}$ mile.

Between these two summits is situated the valley to which Dr. Cullen directed attention in 1850, the existence of which is placed beyond doubt by Commander Parsons, who has laid it down in his chart for the distance of $1\frac{1}{4}$ mile up from its entrance. He was able to see into it from the position in which the *Scorpion* was anchored in the N.W. end of the Channel of Sassardi, the obliquity of its direction preventing its being seen from any other position. Half-way up this valley, which is 3 miles long, is a low and narrow ridge, forming the water-shed between the river that falls into Caledonia Harbour,*— $2\frac{3}{4}$ miles N.W. of San Fulgencio Point, $3\frac{1}{2}$ from the Aglaseniqua, and $4\frac{1}{4}$ from the Aglatumati mouth—and the Sucubti, the waters of which flow into the Chuquanaqua, the Tuyra, and the Pacific. It is, therefore, the lowest summit level between the Atlantic and the Pacific, and is only 4 miles from the former. The height of this ridge is estimated by Dr. Cullen at from 180 to

* It might be called Caledonia River, but that Mr. Gisborne erroneously gave that name to the Aglatumati.

200 ft. On the Pacific side of it is the source of one of the head streams of the Sucubti, which is joined, about $1\frac{1}{2}$ mile lower down, at the foot of the 926 ft. summit, by the Foreti. The way across Agla from the valley of the Aglatumati leads to the junction of the two streams; but the necessity of crossing the mountain to reach the Sucubti may be entirely avoided by entering the valley between Sassardi and Agla, instead of that between Agla and the first range. Canoes can come up to the point of junction, which is scarcely 6 miles from the Atlantic, and from thence there is uninterrupted water communication all the way to the Pacific; so that, by cutting for about a mile through the ridge, a passage for canoes could be opened from ocean to ocean.

It would be quite practicable to open a canal for ships down the Sucubti and the Chuquanaqua to the Tuyra, which, at the confluence of the latter with it, is a great river, with water enough for the largest ships, and a considerable rise of tide; but such a line would be three times the length of that by way of the Savana.

The elevation of the bed of the Sucubti falls from about 180 ft. at its source to 70 or 80 ft. at its mouth. From the bank of the Chuquanaqua opposite the Sucubti mouth, where the line crosses it, the land gradually rises from 70 or 80 to 120 or 130 ft. in a distance of 7 miles. It then falls for $8\frac{1}{2}$ miles to the confluence of the Lara with the Savana, where there are 5 fathoms of water, and where the Pacific tide rises 14 ft.

The most important elevation to be ascertained is that of the ridge, which is only 4 miles, or two hours' walk, from Caledonia Harbour, and which will admit of being cut down to such a depth as to reduce considerably the amount of lockage that would otherwise be required.

GEOLOGY.

The material to be excavated consists of alluvial deposit of very great depth—clay, gravel, and rock. "The shores and the sides of the smaller hills," says Parsons,* "are composed of an accumulation of coral deposit, forming, in some places, a loose kind of coralline limestone, but in general being disconnected. This substance is found to some distance inland, on removing the substratum of alluvial deposit, rendering it probable that the low land from the base of the hills has been formed by drift or upheaval in no very remote age." The soft material removed by Captain Hollins, of the United States' corvette *Cyane*, in boring for a well near San Fulgencio Point, was dolomite (mag-

* "Sailing Directions for Part of the Isthmus of Darien," accompanying his Chart.

nesia 48, lime 52). In the beds of the smaller rivers there are rounded pebbles, and some of the larger rivers are crossed, high up, by ledges of slate. Unfortunately, the boring instruments brought out in 1854 were not even landed. The same thing occurred in the abortive French expeditions of 1860 and 1861, the reports of which were published by M. Paul Roger, the administrator of La Société Civile du Canal du Darien, by which they were sent out, in a book entitled "Percement de l'Isthme Américain—Journal des Explorations dans le Darien." In 1860 M. Feragns, M. Paquet, and others landed at the mouth of the Aglatumati—the wrong place as usual—but, being confronted there by six Indians, by whom they could not make themselves understood, and who seemed to assume a hostile attitude, they returned at once on board the French vessel of war, *Lucifer*, Captain Marivault, and sailed back for France *re infectâ*. In 1861, MM. Bourdiol, Paquet, de Champville, de Puydt, and the Abbé Amodru, accompanied by a cook,* went, *viâ* Aspinwall and Panama, to the Gulf of San Miguel and the river Savana, and ascended the latter as far as the mouth of the Lara, from whence they penetrated some miles on foot; but, having chosen the time of the heaviest rains for their exploration, they found the country so inundated that, before reaching the Chuquanaqua, they were up to their shoulders ("jusqu'aux épaules") in water! They, therefore, returned to Paris, and the Society dissolved.

WORK TO BE DONE.

There would be no work to be done in the harbours or the approaches to the canal, except the erection of light-houses, the placing of buoys, the deepening of the Bight of San Fulgencio for a quarter of a mile from its present depth—12 to 24 ft.—to a uniform depth of 30 ft., the removal of a few small shoals in Caledonia Harbour, of the shoals (reventazones) between Golden Island and Point Escoces, and of El Buey Shoal in the Gulf of San Miguel. Trollope Rock, 15 miles true W. of Garachiné Point should also be removed by blasting. Should the depth at Lara mouth be found to fall below 5 fathoms in the dry season, some dredging would be required in the Savana for a mile or so below that point. With these exceptions, the whole amount of work to be done would be to cut a canal 12 miles in length, from Caledonia Harbour to the mouth of the Asnati; to canalise the

* This was M. Bastide, the highly esteemed *cocinero* of the Western Hotel at Panama. In 1865, M. de Puydt sent him up the Tuyra, with instructions to cross from thence to the Tarena; but, on reaching Molineca, the people of that village refused to let him pass beyond it.

Sucubti from thence to the Chuquanaqua—a distance of $11\frac{1}{2}$ miles—and to cut a canal, $15\frac{1}{2}$ miles long from the Chuquanaqua to the Savana. A most abundant supply of water for the highest levels could be obtained from the head of the Sucubti, the Foreti, Moreti, Asnati, Napsati, Chueti, Tubuganti, Artuganti, La Paz, and several other rivers, each of which pours forth, in the driest season, a volume of water far beyond what would be required for the canal. In this, as in other respects, the country offers every facility for the construction of a canal with locks.

The height of the summit levels, the number of cubic yards of earth and rock to be excavated, the nature of the latter, and the number of locks that will be required, have yet to be ascertained. The width of the canal will also be a point to be considered by the engineer, who will have to decide whether it would be better to make it wide enough for the passage of two ships abreast, or of one only, with lie-by places at which ships might pass each other.

However scanty and incomplete the information that can now be offered on this line may appear, it is yet sufficient to prove that, besides the pre-eminent recommendation of being provided with excellent harbours at each terminus, it has the additional advantages of shortness, low elevation, and healthiness. Dr. Cullen, therefore, considers himself justified in asserting it to be the most eligible route for interoceanic communication, and is confident that, when as admirable a survey shall have been made of it as those of the Panama, Nicaragua, and Atrato routes, by Garella, Childs, and Michler, it will be found to require a lesser amount of excavation and fewer locks than any of the other proposed routes.

In fact, a glance at the map will convince the most sceptical that nature has most unmistakably marked out this tract for the junction of the two oceans, and the breaking of the continuity of North and South America. Indeed, the line of division is so narrow and so low that it is likely the two seas did once meet here.

Considering the rapid strides that engineering science has made quite recently, and is still making, it would be waste of time to adduce any arguments to prove that there is nothing “stupendous,” as the phrase used to be, in this undertaking. It is enough to allude to the Languedoc, Erie, Ganges, East Jumna, West Jumna, and Baree Doab Canals, and to the great canalisation and irrigation system in China. In comparison with any one of those great works, long ago completed, the proposed canal in Darien seems quite a trifling undertaking. It will be, after all, little more than $1\frac{1}{2}$ times the length, and $1\frac{1}{2}$ times the

depth, of the Caledonian Canal, which was completed by Mr. Telford in 1822, the total cost having been 905,258*l*.*

COST.

There are, as yet, no data upon which an estimate of the cost of the work could be framed. A rough, approximate calculation has, however, been made under the following circumstances. The author having, in 1857, presented all the plans and documents bearing on the matter to the Emperor of the French, his Majesty, after examining them, forwarded them to Count Walewski, who appointed a commission of engineers of the Corps des Ponts et Chaussées to study the question. The result at which they arrived, after an investigation which occupied three weeks, was that the canal was practicable without a tunnel, and could be completed for 150,000,000 francs, or 6,000,000*l*. sterling. The estimate drawn up in 1864, by M. Mougél Bey, the Chief of the Corps, is as follows :

	Francs.	Centimes.
Excavation of the Canal	76,027,437	25
Dredging of the Savana	3,080,000	„
Aqueducts	490,000	„
Turning the course of Rivers	1,241,660	„
Machinery, Locks, &c.	33,176,080	„
Material, Buildings, Tools, clearing Forest, and } Expenses of Administration }	19,400,000	„
Contingencies	39,584,822	75
	<hr/>	
	173,000,000	„
	or £6,920,000.	

A considerable reduction might be made by canalising 12 miles of the Sucubti, as already suggested, but no data can be given for the expense of such a work. The estimate made

* The Caledonian Canal, 23 miles 8 chains long, 122 feet wide at top, 50 feet at bottom, has a depth of 20 feet in general, but, in some parts, not more than 17. There are 28 locks, each of which, except the regulating or guard locks, has a lift of 7 or 8 feet. It consists of several short canals, connecting together some locks, and thereby establishing a communication between the Atlantic Ocean and the German Sea.

The main line of the Forth and Clyde Canal is 35 miles long, 56 feet wide at top, 27 at bottom, and 10 feet deep. In 10 $\frac{3}{4}$ miles from Grangemouth it rises 156 feet by 20 locks. The summit level continues 16 miles, and from it to the Clyde there is a descent of 156 feet by 19 locks. It had to be carried through moss, quicksand, gravel, and rocks, over precipices, and across valleys, in the course of which, besides smaller ones, 18 drawbridges, and 15 aqueducts, with several tunnels, had to be constructed. It was commenced in 1768 by Mr. Smeaton, and completed in 1790, at a cost of 200,000*l*.

by M. Thomé de Gamond* for canalising the whole course of the San Juan de Nicaragua, 119 miles, amounted to 24,100,000 francs, or 964,000*l.*; but the fall of the San Juan is little over one foot per mile, whilst that of the Sucubti is, perhaps, 5 or 6 ft. per mile. A most abundant supply of material for the embankments could be obtained close at hand, from the excavations for the canal at either end of the canalised portion of the river.

The whole work might, perhaps, be done by 15,000 men in four years. Allowing 80*l.* a year for the wages and food of each, the cost of the labour would be 4,800,000*l.*

SEASONS.

“The seasons in Darien are the dry and the rainy. The dry season, from December to May, is during the time of the strong trade-winds, which cause the vapours to pass over the mountains to the Pacific. These are arrested when the winds become lighter, and then the rainy season commences, which lasts till December, with fine weather at intervals. The breezes in the dry season are exceedingly strong, causing a heavy sea to prevail along this coast. Care must be taken, in standing in for the land, to allow sufficient room for wearing, in the event of missing stays, a thing of frequent occurrence with us.

“The average temperature is about 82° Fahr. The atmosphere is exceedingly moist and hazy, by exhalation from the sea, and the land sometimes cannot be seen more than 5 miles.”*

WINDS.

Of the winds, Parsons says: “The prevailing wind here is from N.N.W. to N.N.E. This is the trade-wind, which, turned from its direction by the high land of the continent, and finding a void in the Gulf of Darien, rushes in to fill it. From January to April we had it constantly blowing in this direction, with an approach to calm at night. In the rainy season, the wind ceases at night, and a land wind blows from the mountains, with occasional squalls with rain from the S.W.; but I think it would seldom blow with any force from the S.E. or E.

“Hurricanes are unheard of in this quarter, it being sheltered by the land to the eastward; and these gales never pass over large continents, confining themselves principally to the open sea, or only passing over small islands.

* Gamond, Thomé de. Carte d'Etude pour le tracé et le profil du Canal de Nicaragua. Paris, 1858.

† Parsons' "Sailing Directions."

"Earthquakes must be rare, as the Indians do not recollect the ground shaking at any time. This fact would be favourable to the permanency of a ship canal when once established."*

CLIMATE.

From the total absence of swamp, marsh, or fen along the line, and the great number of rivers and rivulets (quebradas) with rapid currents, which drain the adjacent country, and prevent the lodgment of stagnant water in its vicinity, the climate may be considered healthy, and the occurrence of malarious fevers amongst European labourers, if well cared for and of *temperate habits*, need scarcely be apprehended.

The reports of Dr. McDermott, of H.M.S. *Espiègle*, Dr. Brownlow, of the U.S. corvette *Cyane*, Dr. Rondat, of the French war steamer *Chimère* (avis), and Dr. Ross, of H.M.S. *Virago*, show that, amongst 900 men who composed the crews of the vessels which lay at anchor in Caledonia Harbour, and 250 men of the *Virago*, which was stationed in the river Savana, in 1854, not a single case of sickness occurred during the three months of their stay; whilst the convalescence of those who were sick on the arrival of the vessels there was unusually rapid.

Dr. McDermott says, in a letter in the *Medical Times* of January 17, 1857: "It results from the experience of Dr. Ross, Dr. Brownlow, and myself, that the popular idea of the unhealthiness of Darien is quite erroneous. Not a single case of sickness occurred amongst any of the parties sent on shore from the *Espiègle*, *Cyane*, and *Chimère*, whilst the patients who were on the sick lists of those vessels, on their arrival in Darien, rapidly convalesced. Indeed, it was remarked by all the medical officers that the crews of the vessels were in better condition on leaving Darien than when we arrived there. From all the

* The exemption of Darien from volcanic disturbance is remarkable. It appears to be one of those limited districts sometimes found in volcanic regions, on each side of which earthquakes and eruptions occur without affecting the central district. Reasoning upon the causes why certain intermediate points at the surface of the earth, and in the direction traversed by earthquakes, are unaffected by their influence, Humboldt, as if to bear out the assertion of the Panamenians that their province is not troubled by them, observes: "This phenomenon is frequently remarked at Peru and Mexico in earthquakes which have followed during ages a determinate direction. The inhabitants of the Andes say, with simplicity, speaking of an intermediate ground, which is not affected by the general motion, that it forms a bridge (*hace puente*), as if they meant to indicate by this expression that the undulations are propagated at an immense depth under an inert rock." It does not appear that there have been eruptions or earthquakes during the last few centuries in any part of the Isthmus of Darien."

inquiries that I made among the natives, I could not ascertain that any particular form of fever or other disease prevailed among them, and, from their appearance, I would say they are a very healthy race."

Commander Parsons, also, says: "During our stay, from January to April, we found the climate to be healthy, having had no cases of fever, although the men were greatly exposed." Lastly, Mr. Gisborne, in his Report to Lord Wharncliffe, says: "There have been altogether in this surveying expedition 900 persons subject to climatic influences, some along the coast, and some in the interior, and I believe I am correct in stating that not a single case of illness occurred during the whole period of our stay."

The opinion which the author had previously expressed of the healthiness of the climate, founded upon a consideration of the physical aspect of the tract of country, has thus been corroborated, and receives further confirmation from a document which he found in the course of his researches in the Archives of Bogotà. This was the diary of Sergeant Gabriel Morales, who, with Sergeants Miguel Antonio Delgado and Miguel Quintana, commanded a detachment of 150 soldiers of La Princesa Regiment, who had arrived from Spain only a short time before, and were sent to search for and capture Indians by Lieutenant-Colonel Don Andres de Arisa, the Governor of Darien. They started from the fort of Principe, on the Savana, proceeded to the Moreti, went across the hills to the Sucubti, and returned after an absence of fifteen days in the height of the rainy season, without having seen any sign or trace of an Indian; but in *perfect health*. The diary concludes thus: "July the 25th, at noon, we entered Principe, and presented ourselves to the governor, informing him that the whole of the troops had returned in perfect health, notwithstanding the terribly unfavourable weather they had unceasingly encountered, there not having been one fine day; and that all had used their best endeavours to fall in with the enemy, and returned disconsolate at not having succeeded therein. Puerto Principe, July 25, 1786—Gabriel Morales."

In conclusion, the author begs to refer to the fact that, although the entire Indian population of Darien does not amount to 3000 souls, there were living, and personally known to him, a few years ago, six chiefs, each of whom was 100 years of age or more, viz., Calògwa, John Bull, Shephard, Campbell, and two others whose names he did not learn; whilst the air of Darien would seem to be conducive to longevity even in the case of Europeans, for the late Captain John Shephard, a Scotchman, who spent most of his life on the Darien coast

trading with the Indians, was a centenarian when he died, in 1853, at San Juan de Nicaragua.

MEAN LEVEL OF THE OCEANS.

It was formerly supposed that a great difference of level existed between the two oceans, as well as between the Mediterranean and the Red Sea; but, in both cases, accurate investigations have proved the belief to have been unfounded. In 1855, a series of observations made by Colonel Totten, the Superintendent of the Panama Railroad, on the height of the tides and the levels of the two oceans—in Navy Bay, on the Atlantic, and in Playa Prieta, a bight in the Bay of Panama, on the Pacific—established the fact that the difference of mean level, if any, is very trifling. The following were the results:

	PACIFIC.		ATLANTIC.
	May and June.	November and December.	August and September.
	Feet.	Feet.	Feet.
Greatest rise of tide.....	17.72	21.30	1.60
Least	7.94	9.70	0.63
Average.....	12.08	14.10	1.16
Mean tide of Pacific <i>above</i> mean tide of Atlantic.....	0.759	0.140	...
High spring tide of Pacific <i>above</i> high spring tide of Atlantic.....	9.40	10.12	...
Low spring tide of Pacific <i>below</i> low spring tide of Atlantic.....	6.55	9.40	...
Mean high tide of Pacific <i>above</i> mean high tide of Atlantic.....	6.25	6.73	...
Mean low tide of Pacific <i>below</i> mean tide of Atlantic.....	4.73	5.26	...
Average rise of spring tides.....	14.08	17.30	...
Average rise of neap tides.....	9.60	12.40	...

Colonel Totten thus concludes his Report: "Although my observations make the mean level of the Pacific from 0.140 to 0.759 feet higher than the mean level of the Atlantic, this is probably owing to local circumstances alone. We may, therefore, decide that there is no difference in the mean level of the Atlantic and Pacific oceans." Colonel Totten, it must be observed, was able to test the accuracy of his levelling across the Isthmus upon the finished bed of the railroad, an advantage not possessed by previous observers. The result of the difference of the rise of tide is, that there is a perpetual oscillation—

sometimes the one and sometimes the other sea being the higher—except at mid-tide, when both are on a level. At high water the Pacific is from 6·25 to 10·12 ft. higher, and, at low water, from 4·73 to 9·40 ft. lower than the Atlantic. The time of high water in Navy Bay and Panama Bay is nearly the same, viz., at 3 h. 20 m. at full and change. In Caledonia Harbour it is high water, at full and change, at 11 h. 40 m. The rise of tide there is 1 ft. 6 in. springs; 0 ft. 6 in. neaps. The rise and fall of tide in the Gulf of San Miguel is from 18 to 24 ft.

As the canal must have a few locks, the difference in the rise of tide in the two oceans would have no bearing whatever on the question of its practicability.

POPULATION.

The only inhabited place on the line was the village of Sucubti, population about 70, which was set fire to by the inhabitants and abandoned upon the approach of Lieutenant Strain, on the 25th of January, 1854. When Mr. Gisborne arrived there on the 8th of February, he found nothing but the fragments of some canoes, which had been smashed up to render them useless. The people probably removed to Asnati; and it is likely the place will never be re-occupied, as it was formerly the custom of the Indians to quit for ever any place that had been visited by Spaniards. The only places within 10 miles of the line are—Agla, on the Aglatumati, 3 miles from its mouth in Caledonia Bay, with about 60 inhabitants; and Sassardi, Asnati, and Moreti, with 50 or 60 inhabitants each. Agla and Sassardi were abandoned in 1854. It is very probable that the Indians would give up their claim to that part of the country in exchange for a part of the coast from Cape San Blas to Portobello, which has now, in an extent of 45 miles, only the hamlets of Culebra, Palenque, and Nombre de Dios, with an aggregate population of about 150 negroes, who are descendants of Cimarrones or Spanish maroons.

MEMORANDA FOR FUTURE EXPLORERS AND SURVEYORS.

No “volunteer,” *soi-disant* guide, engineer, or agent of any company should be allowed, on any pretext whatsoever, to accompany the explorers and surveyors to be sent out by the company that may undertake the cutting of the Darien Canal. The intrusion of “volunteers” from the Atrato Ship Canal Company, and the Panama Railroad Company caused the failure of the expedition of 1854.

Before any attempt be made to land in Darien the consent of the Indians should be obtained. It was the neglect of this pre-

caution that led to the unfortunate result of Commander Prevost's ill-advised and misguided attempt to cross the Isthmus.

If treated in a friendly, frank, and conciliatory spirit, and assured that their sovereignty over the Atlantic portion of the line is not disputed, they will offer no opposition. Some of the Sassardi people should be sent for Robinson, who was secretary to Calògwa, the late chief of the San Blas Indians, and who resides at Carti, or Cedar River, in San Blas Bay. This man lived for twelve years in Washington; viz., from 1841 to 1853, and was educated there at the expense of the late Daniel Webster. He is very intelligent and speaks English fluently. He should be requested to invite the old men or chiefs of Sucubti, Asnati, Moreti, Sassardi, and Carreto villages to a conference, at which a treaty of friendship should be concluded with them, and their consent obtained to the making of a survey, and the cutting of the canal. If properly treated, they might provide guides through the forest, and furnish canoes for navigating the Sucubti, and hunters for killing game. A large number of Indians should be induced to accompany the explorers, as guides and hunters; since they would answer as hostages to secure the peaceable behaviour of the others.

The party from Caledonia Harbour should find, on their arrival at the mouth of the Lara, another party stationed there and well supplied with provisions, surveying and boring instruments, &c. The latter should be sent out, *viâ* Aspinwall and Panama to the Gulf of San Miguel and the Savana, a month before the former. The exploring party should be preceded by a sailor, having a ship's compass suspended in front of his breast by straps. Another sailor, with a ship's compass secured in the same way, should bring up the rear. Every member of the party should have a pocket-compass, and know or be taught how to use it.

Every one of the party, except the sailors with the compasses, who should have no article of iron about them, should have a machete or bush-cutlass, with which he should notch the barks of the trees in going along, so as to make a *picadura* or blazing. By taking this precaution stragglers will escape the danger of being lost in the bush; and, in case of difficulty, the party can at any time find their way back. Had Lieutenant Strain's party adopted this plan, they would have avoided the dreadful sufferings they endured through neglect of it.

The distance should be measured by a chain, and every hour's course and distance logged. Observations for latitude and longitude should be taken at every important point, to serve as astronomical bases. Frequent barometrical observations should also be taken with the view of ascertaining the heights and finding the lowest levels.

Ranchos or sheds, made of poles stuck in the ground and thatched with palm leaves, should be built at convenient distances. One of them can be made in an hour, as *guagaras* or fan-leaved palms are everywhere abundant. The bush and timber felled in making the paths should be burned as soon as possible.

Negroes accustomed to work with the machete (*macheteros*) can be engaged at Cartagena, Portobello, or Aspinwall. They are the best men for clearing bush and cutting paths; but permission for them to land should be obtained from the Indians, as they have a great aversion to negroes, at least, Spanish negroes; possibly they might not object to Jamaica men.

The only right place to start from is the western extremity of the bight N.W. of San Fulgencio Point, in Lat. $8^{\circ} 53' 45''$, Long. $77^{\circ} 43' 30''$. By proceeding from thence, a little more than $\frac{1}{2}$ a mile to the W., and then 2 English miles, S. true, the entrance of the valley will be reached. The chief engineer, in 1854, landed in Caledonia Bay, 3 miles S.E. of the above point, and went up the Aglatumati, although Dr. Cullen had advised him to land at Caledonia Harbour, and told him that there was no pass from the Aglatumati.

A light elongating ladder for ascending the trees on the summit of the Cordillera, and a stationary balloon would be useful for the purpose of obtaining an uninterrupted view over the country. A light boat should be carried across to the Sucubti, as it is probable that the hamlet has not been re-occupied, in which case a canoe could not be got there. Rafts should be constructed of the wood of the balsas, or other light timber, to convey the party down the Sucubti. The path from the Chuquanaqua to the Savana should commence either opposite the mouth of the Sucubti, or anywhere within a distance of 4 or 5 miles below that point. The surveyors can alone determine the line of lowest elevation. The exploration being ended, and the line to be surveyed marked out, the engineers can commence the survey. Until that time, the conduct of the affair should be entrusted to some persons experienced in exploring forests in the tropics. The best time for exploring the Isthmus is from the beginning of December to the beginning of April; that being the dry season the rivers are then low, and the heat is tempered by a N.E. sea breeze. The party should arrive in Darien on or before the 1st of December.

ADVANTAGES OF A SHIP-CANAL.

Not only would all the commerce of the western shores of North and South America pass through the canal, but, after its opening, no voyages would be made round the Cape of Good

Hope to China and Australia, as they would be much more accessible by the Darien Canal than by the present circuitous route, and the voyage could be made within one tropic, whilst, at present, a vessel must pass four times through each tropic in a single voyage out and home.

As regards passages to and from the west coast of North and South America, it is sufficient to say that to sail, for instance, from Aspinwall, the Atlantic terminus of the Panama Railroad, to Panama, a distance of 46 miles by land, it would be necessary to sail from 9° N. to 55° S. latitude, in order to weather the stormy Cape Horn, and to return up the west coast to 9° N. on the Pacific side. The ship would thus have to sail over 64° of latitude on each ocean, or 7680 nautical, equal to 8896 English miles, on a single passage, or 17,792 miles on a voyage to and from. Besides this enormous distance in latitude to be traversed, it must also be taken into account that, on such a passage, a vessel would have to run off to the eastward as far as 30° W. longitude, in order to avoid the coast of Brazil, and to make back the same distance to the westward. She would also be obliged to beat to windward both in the Atlantic and Pacific, against the S.E. trade-wind in the former, when bound from Aspinwall to Panama; in the latter, when bound from Panama to Aspinwall. Moreover, the terrific storms from the W., often experienced off Cape Horn, might delay her entrance into the Pacific for weeks. Vessels bound either to or from China and Australia would, by the Darien route, have such fair, steady, regular winds, that their arrival might be calculated upon with precision and accuracy. In a passage to China by the canal, a vessel, having cleared its Pacific terminus, would at once enter into the track of the N.E. trade-wind, which blows between the parallels of 10° and 25° N., and, her course being W., she would be carried with a fair and steady breeze directly to her destination. On the return voyage from China to the entrance of the canal, a ship would at once run up to between 30° and 40° N., so as to be clear of the region of the N.E. trade-wind, and avail herself of the strong W. winds that prevail between those parallels to steer an E. course to the coast of Mexico. There she would meet the N. land-wind, which would carry her with a flowing sheet down to the Isthmus.

On a passage out to Australia a ship would, after leaving the canal, enter a narrow track extending from 10° to 4° N., in which the winds are variable. Having crossed this, she would enter the region of the S.E. trade-wind, which would be a fair wind, her course being W.S.W. Having passed the southern limit of this wind, in 23° S. latitude. she would enter the region

of the N.W. wind, which would also be favourable to her course. On her return from Australia she might at once run up into the S.E. trade, in Lat. 23° S., from whence, her course being about E.N.E., she would have a perfectly fair wind all the way. Or she might run down part of her easting within the limits of the N.W. wind, and then run up into the S.E. trade, by doing which she would have the wind a couple of points more free.

The vast saving of time by the adoption of this passage, which will enable ships to make two or three voyages in the same period that they now take to make one, the saving of expense in their navigation, of wear and tear, of interest on the value of ship and cargo, of insurance of ship, cargo and freight, and the great diminution of shipwreck and loss of life by sea, will effect a complete, but beneficial, revolution in commerce.

Not only will a great saving of time be effected by the direct diminution of distance to be traversed between Europe and the E. coast of America, on the one side, and the W. coast of America, China, Japan, Australia, &c., on the other, and *vice versa*, but also by the avoidance of the loss of time occasioned by calms in the low latitudes, hard gales off the capes, and the very long tacks to the eastward and westward which vessels are now obliged to make, in beating against the S.E. trade in the South Atlantic, or the N.E. or S.W. monsoon in the China seas. By the proposed canal all those causes of delay will be obviated, and fair, steady winds, smooth seas, and pleasant weather throughout the voyage—both out and home—may be fairly calculated upon.

Nor are the benefits resulting from increased intercourse and proximity the only advantages which may be hoped for. The safety of life and property will be greatly increased, the hardships of thousands of mariners will be lessened to an incalculable extent, and the facilities for benefiting our fellow-creatures will be greatly multiplied.

The gold discoveries in California and Australia have imparted an impulse to ocean navigation, to the results of which it is impossible to assign any limits; nor, until the Darien Canal is completed, can we estimate the effect it will have in diverting the commerce between the E. and W. hemispheres from the old routes. That by Cape Horn will be totally abandoned, and that by the Cape of Good Hope will be preferred only by vessels bound to the hither side of the Straits of Malacca. To all countries lying farther east—to China, Japan, Australia, &c.—the most comfortable, safe, speedy, and least expensive route will be through the Isthmus of Darien Ship Canal.

SAVING OF TIME AND MONEY.

The saving that would be effected by the adoption of this passage may be illustrated by the following comparison of the expenditure of time and money on the passage of a ship, with a crew of 30 men, from New York to California, *viâ* Cape Horn, with what it would be by way of the canal :

<i>Viâ</i> Cape Horn.	<i>Viâ</i> Canal.
Time, 150 days.	Time, 45 days.
Salaries, and finding of officers and crew, for five months, 5880 dollars.	Salaries, and finding of officers and crew, for 1½ month, 1764 dollars.
Insurance on 90,000 dollars (value of ship) for 5 months, 3600 dollars.	Insurance for 1½ month, 1080 dollars.
Wear, tear, and depreciation, at 10 per cent. per annum, for 5 months, 3750 dollars.	Wear, tear, &c., for 1½ month, 1125 dollars.
Total . 13,230 dollars.	Total . 3969 dollars.

Difference in favour of the canal, 105 days and 9261 dollars. From England to California the saving would be somewhat greater.

Supposing the value of the cargo to be 100,000 dollars, the saving on it would be as follows :

<i>Viâ</i> Cape Horn.	<i>Viâ</i> Canal.
Interest at 7 per cent. per annum, for 5 months, 2916 dollars.	Interest at 7 per cent. per annum, for 1½ month, 874 dollars.
Insurance at 4 per cent., 4000 dollars.	Insurance at 2 per cent., 2000 dollars.
Total . 6916 dollars.	Total . 2874 dollars.

Difference in favour of canal 4042 dollars.

The total gains of ship and cargo would therefore be 13,303 dollars, or about 6 per cent. on the value of both.

With respect to the cargo, it would avoid the damage of goods going round Cape Horn—at present a very heavy percentage on their value. Rear-Admiral Davis calculates, from the incomplete returns for 1857, that the saving to the trade of the United States, England, and France by the canal route, if then open, would have amounted, for that year, to 48,130,208 dollars, or 10,829,296*l.* 16*s.* He calculates the value of the ships and cargoes which would have passed through the canal that year at 467,831,130 dollars, or 105,262,004*l.* 5*s.*

The field for enterprise which will open itself, once there is a passage for the ships of all nations through the narrow strip which divides the oceans, appears almost unlimited. The removal of this barrier would be the mightiest event in favour of

the peaceful intercourse of nations which the physical circumstances of the globe present to the enterprise of man, and would effect a complete revolution in the commercial relations of the world. Incalculable as would be its advantages in the present state of commerce, these benefits would be multiplied by the effect which such increased facilities of communication and exchange would exert to stimulate the immense masses of the human race thus acted upon to new efforts of industry in the development of the resources of the richest portion of the globe, and thereby to increase their wealth and material comforts, whilst, in the eye of the philanthropist, the moral influence upon all that section of the globe of a closer and more intimate communication with the civilisation and institutions of the more favoured countries of the North Atlantic will constitute a motive not inferior to the aggregate of all the material advantages enumerated above. The Emperor of France has said, "A ship canal would raise immediately to a prodigious degree of prosperity those countries which such an enterprise would cause to be traversed every year by thousands of merchant vessels, would open new marts for produce, and hasten by several centuries the march of Christianity and civilisation over half the globe."

It is the great political, commercial, financial, scientific, moral, and religious problem of the age, which, when accomplished, will do more to Christianise and civilise mankind than any other project. This cosmopolitan work, once completed, will endure for all ages a monument of man's enterprise and ability, surpassing all others ever accomplished. In the words of the *Times*, "It is the *grandest physical work the world can witness*: the past has seen nothing like it, and any similar fame must be denied to the future, since there will be no more hemispheres to join." The *Sun* has said, "Ere long Darien will be the great inter-oceanic portal, the door of the seas, the entrepôt of the world, the store-house of nations, the grand highway of commerce." And its execution will confer upon mankind greater blessings than mere monetary ones. All the commercial nations in the world will join in guaranteeing the neutrality not only of the territory through which it will pass, as has already been done by England and America in the Bulwer and Clayton Treaty, but also of the seas for 1000 miles or more from either terminus. The coasts will become common ground where war shall not approach. This is the way towards securing Universal Peace. The Greeks had their games so that they might meet on common ground once a year. The Isthmus of Darien will be common ground every day in every year, where all the nations of the earth will meet in peace.

As a mercantile investment, there is no doubt that this inter-

oceanic navigation will be one of great pecuniary advantage. When we consider the fleets of ships of all nations that will desire to save the thousands of miles of distance which this canal will enable them to do, the magnitude of the undertaking is met by the certainty of the enormous profits which must result to the proprietors. No project has ever been before the public which embraces anything like the objects to be attained by this canal. All other propositions have but local importance, and seek their profits from local trade; but this one is adapted to every ship afloat, and seeks a return from the trade of every country. Every maritime nation has an interest in its success; and, as a railway makes its own traffic, so will this work most certainly greatly increase the commerce between the distantly separated countries which steam power is only now beginning to reach.

In such a case statistics are almost superfluous; it is safer to consult the history of the progress of commerce, and argue from it, than to calculate the profits from the existing state of things. But even on this limited ground it can be shown that the capital invested will meet with a good return by charging for tollage only a little more than the amount saved in the insurance, without reference to all the other advantages which the canal will offer.

The *Times*, of October 15, 1850, states: "The traffic that would pass through the canal, estimated now on the basis adopted in 1843, would amount to 1,700,000 $\frac{1}{2}$. In the hands of the most timid this calculation could scarcely be reduced to any point that would leave the enterprise other than a legitimate and attractive one. But the great feature always to be borne in mind with regard to it is, that it would be so identified with the progress of the world that its returns at any one period could never be taken to limit our ideas of what they would become hereafter. At the present moment, for instance, the calculations would be based on the existing tonnages of the various maritime powers and the present position of the channels of general commerce; but when we consider that the shipping of the United States' doubles itself every 15 years, and that of England still increases rapidly, the prospects of the changes to be wrought by the undertaking will appear still further beyond the grasp of any of the common conceptions of past experience."

TRAFFIC.

To give an approximate idea of the traffic that will be likely to pass through the canal, the following list has been drawn up from the "Statistical Tables relating to Foreign Countries,

Compiled from the Official Returns of the respective Countries, Part 10," and from the "Statistical Tables relating to Colonia, and other Possessions of the United Kingdom, presented to both Houses of Parliament by command of her Majesty," 1866.

It represents the number and aggregate tonnage of vessels entered inwards and cleared outwards at Pacific ports, from and to Atlantic ports.

	Number of vessels entered inwards and cleared out- wards.	Tons.
Aspinwall or Colòn, Navy Bay, 1864..... [These vessels would have passed through, if the canal had been open.]	533	463,305
Panama, 1864.....	276	364,416
Punta Arenas, Costa Rica, 1864.....	140	112,530
Guatemala.....	No returns.	
San Salvador.....	Do.	
Mexico, west coast.....	Do.	
San Francisco, California, 1864..... [In 1853, the number of vessels was 2683, and the tonnage was 1,198,827 tons.]	922	675,481
British Colombia, 1863.....	{ Returns incomplete.	
Vancouver's Island, 1863.....	1171	223,676
Honolulu, &c., Sandwich Islands, 1865..... [Entered only. Entered and cleared, in 1855, 640 vessels, and 455,790 tons.]	151	67,068
Sitka and Russian America	No returns.	
Kamtschatka.....	Do.	
Ecuador, Guayaquil only, 1864.....	406	104,771
Peru, 1865. Islay only..... [In 1855, 404,638 tons of guano were ex- ported. In 1858, the total tonnage was 830,000 tons.]	74	33,952
Chili, 1863.....	2650	1,558,650
Tahiti, Society Islands, Port of Papeete, 1864.	206	21,361
Hong Kong, 1863..... [Total tonnage of Hong Kong, 1,806,881 tons.]	294	214,138
Nagasaki and Hakodadi, Japan, 1865.....	479	160,484
Labuan, 1863..... [Entered only.]	3	1,670
Siam, Bangkok, 1865.....	146	52,197
Philippine Islands, Manilla, &c., 1864.....	No returns.	
Java and Madura, 1863.....	555	358,880
Australia and New Zealand, 1863..... [Total tonnage, 3,834,772 tons.]	923	655,586
	8929	5,088,165

The tonnage of China should be added to the above; but, of the 16,684 British, European, and United States vessels, with an aggregate tonnage of 6,458,515 tons, which entered and cleared from the ports of China (exclusive of Hong Kong) in 1864, the statistics do not state what number sailed from and to ports on the Atlantic.

In 1854, the commerce between the United States and the Pacific (exclusive of California) amounted to 957,599 tons, in 1856 vessels; the value was 33,953,456 dollars.

In 1858, 1,000,000 tons of freight were carried to Australia in American ships.

In 1863, the value of the imports into Australia was	£34,264,597
Exports	28,378,355
Total	£62,642,952

The export of bullion and specie, included in the above, amounted to £12,677,319.

The export of gold from Australia from 1851 to 1866 amounted to £140,000,000. This quantity of gold would form a pyramid 50 ft. 10 in. high, and 10 ft. square at the base; its cubic measure would be 1994 ft., and it would represent a weight 1071 tons 3 qrs. 12 lbs. The population of Australia, in 1863, was 1,439,050.

The value of the cargoes that would pass through annually would amount to 150,000,000*l*.

FINANCE.

The profits that would be derived from the canal would consist of the tolls on ships passing through it. If we add to the 5,088,165 tons, given above, 500,000 for places from which the returns are wanting or incomplete, and 2,500,000 for China, the total will be upwards of 8,000,000 of tons, which, at 5*s*. per ton for tollage, would yield a revenue of upwards of 2,000,000*l*. per annum.

Besides this, a large income would be derived from the sale or renting of lots of land, which would be required for building on, as a "Magic City" would soon spring up at either terminus, and, at a later period, land would be in demand for tillage and grazing farms, for raising vegetables, and rearing cattle for the revictualling of vessels* passing through.

The canal once cut, the expense of its maintenance would be very trifling.

It may, then, be assumed that the profits of the canal will pay an interest of 33 per cent. on 6,000,000*l*., its probable cost; and

* This would render a larger part of their space available for the stowage of cargo.

this would be always increasing *pari passu* with the increase of the population and commerce of the world.

Any company that may undertake the construction of the canal will find it necessary to devise means for the payment of a sufficient rate of interest on the capital whilst the work is in progress. This will be a matter of little difficulty, for, considering that the company will have a legitimate claim upon the governments of the principal maritime nations for aid in the inception of a work fraught with such beneficial results to the commerce of the world, doubtless an application to them will be at once responded to by the discharge of this obligation to the shareholders.

Estimating the time that will elapse before the canal can be opened, and before any revenue can be derived from it, at four years, and the cost of construction at 6 millions sterling, and supposing that the Governments of England, France, Russia, Prussia, Austria, Italy, Spain, and the United States, should pay between them 5 per cent. on the stock issued, the following would be the sums to be advanced by each of them :

5 per cent. on 1st issue of 1½ million for 4 years	£37,500
„ 2nd „ 3 „	28,125
„ 3rd „ 2 „	18,750
„ 4th „ 1 „	9,375

Total subscription from each nation £93,750

At the audience which the deputation from the Atlantic and Pacific Junction Company had with the Emperor of the French, on the 29th of March, 1853, his Majesty declared his willingness to pay all the capital that would be required for the work over and above 6,000,000*l.*; and also to join England and America in guaranteeing 3 per cent. interest, and 1 per cent. for a sinking fund.

A proposition was made by the author several years ago to Lord Palmerston, the basis of which was, that the different governments should cut the canal at their joint expense, and then *throw it open to the shipping of the world free of tolls*; but the answer he received was, that the work must be done by private enterprise. The resources of each of the contributing states would be drawn upon very lightly to make up a total of 6,000,000*l.*, which would be 500,000*l.* each, for England, France, Russia, and the United States; 400,000*l.* each, for Austria, Prussia, Italy, Spain, and Portugal; 150,000*l.* each, for nine other maritime nations of Europe; and 46,500*l.* each, for the 14 South and Central American States.

POLITICAL CONSIDERATIONS.

The political considerations that will arise upon the execution of this work are exceedingly simple. The canal must not be

under the control of any one or two of the great powers. It must belong to the world, like the oceans which it will connect. It must be the world's highway, open to the commerce of every nation. The neutrality of the Isthmus must be guaranteed by all the powers as also that of both oceans, to the distance of at least 2000 miles from each end of the canal. The first point has been already agreed upon, and the principle of the second has been admitted by the Governments of Great Britain and the United States, in the 2nd Article of the Bulwer and Clayton Treaty of 1850,* which runs thus: "Vessels of Great Britain or the United States traversing the said canal shall, in case of war between the contracting parties, be exempted from blockade, detention, or capture by either of the belligerents; and this provision shall extend to such a distance from the two ends of said canal as it may hereafter be found expedient to establish." The *Times* of December 10, 1856, in an editorial on Dr. McDermott's letter on the Darien Line, says: "This work affects the common interests of mankind, and the more numerous the nations which are concerned in it, the fewer are the chances that the free passage will be interrupted by the contingencies of future warfare."

The sovereignty of New Granada over the Isthmus was guaranteed by the United States, by the Treaty of December 12, 1846. The former thereupon abolished the Custom-houses, and agreed to admit all foreign imports into the Isthmus free of duty, with the exception of a small municipal tax.

THE DESIDERATUM.

The immediate desideratum is a detailed survey of the line. Its entire length being only 39 miles, this may be accomplished by a few engineers in three months; but it would be better to devote six months, or an entire dry season, to a thorough examination of the line and the adjacent country. The salaries and maintenance of the engineers for three or six months would constitute the whole expense, as the Emperor Napoleon long ago promised the author the assistance of a vessel of war from Martinique, and of an officer of the Corps des Ponts et Chaussées, and, doubtless, the British Government will fulfil the promise made to him by the late Lord Palmerston, that, whenever he should be prepared to survey the line, he would order a ship and an officer of the Royal Engineers to accompany him from Port Royal, Jamaica, to Darien. The United States Government will also, of course, send a vessel and an engineer. With the aid of the Government engineers, and parties of sailors from the ships, and also of a large number of convicts

* Signed at Washington, April 19; ratifications exchanged at Washington, July 4, 1850.

under a guard of soldiers, who will be sent from Carthagena by the Government of Colombia, the engineers of the future association or company will have no difficulty in completing a thorough survey in six months. But, before they commence the survey, it will be absolutely necessary that the line should be marked out and cleared by a party of macheteros under the direction of a competent person.

THE CONCESSION.

A privilege for cutting a canal by this line, and levying tolls, together with a concession of all lands necessary, and of 100,000 fanegadas, or 200,000 acres, in addition, was granted by the Government of New Granada, at Bogotá, on the 1st of June, 1852, to Edward Cullen, Charles Fox, John Henderson, and Thomas Brassey. This privilege, which was for 99 years, lapsed.

In 1859, upon the author's application at Bogotá, the Congress gave authority to the President to renew the above concession. The latter delegated his powers to Don Juan de Francisco Martin, the Minister at Paris, by whom a conditional concession was granted to Edward Cullen, MM. Paignon and Vaudaux, and Paul Roger. But this also having become null and void, the concession was successively applied for by M. Paul Roger, on the part of the Société Civile du Canal du Darien, by Messrs. Page and Dewsbury, by Admiral Elliott, MM. Carion and Vanderhest, and M. Lucien de Puydt.

But the reply of the Congress to all applicants was that the concession would only be granted to such individuals, or company, as should have caused a detailed survey of the line to be made, and forwarded copies of the plans of the engineers to the Government at Bogotá.

Thus, any association that may undertake to survey the line will be amply remunerated by the privilege of cutting a canal, and the concession of the valuable tract of country which it will traverse. The survey and concession will constitute a basis upon which it will not be difficult to form a company for the purpose of raising the capital necessary for the execution of the work.

In conclusion, it is confidently expected that this Society, which reckons amongst its members some hundreds of scientific and practical engineers, will be able, ere long, to give satisfactory replies to the following questions:—Shall a narrow strip of land, not 40 miles across, be allowed any longer to remain a barrier on the highway of nations? Shall the engineering genius of the most civilised nations, even with the aids that chemistry places at its service, in gun-cotton and nitro-glycerine, confess itself baffled by the notion of cutting a canal 39 miles long?

March 2nd, 1868.

BALDWIN LATHAM, PRESIDENT, IN THE CHAIR.

ON THE ISTHMUS OF PANAMA.

DISCUSSION.

MR. J. WYATT said that he took a great interest in the crossing of the Isthmus of Panama, and had twice crossed it himself. He had also been in communication with the countries of the Isthmus for the last ten or eleven years. He knew the engineer of the Panama Railway very well indeed; and the conclusion to which that gentleman, himself (Mr. Wyatt), and other persons had arrived, was that Dr. Cullen was labouring under an entire delusion. He said that advisedly, but not in any interest of the Panama Railway Company. It was the opinion of many who knew that part of the world intimately that the idea that there was a valley, as described by Dr. Cullen, was a mistake. Dr. Cullen's statements from time to time had been the cause of four expeditions for exploring purposes to the Isthmus of Darien, namely, two under Mr. Gisborne, one under Lieutenant Strain, and the other under Commander J. C. Prevost. All those expeditions had failed to find the remarkable indentation or gap in the Cordilleras, the existence of which was alleged by the author of the paper. Since Dr. Cullen's first paper was read to the society, he (Mr. Wyatt) had received a copy of the *Panama Herald*, in which was published a paper from the National Archives in Bogotá, New Granada, being a description of Santo Domingo del Darien, compiled in the year 1754, by officers of the Spanish government from an actual exploration of the Isthmus. That paper described all the available crossings of the Darien country and the different settlements there. One of those crossings was over the very part described by Dr. Cullen—the valley of the Sucubti. A section of the Sucubti river was taken by Mr. Gisborne, and showed an elevation of a thousand feet above the two seas. Mr. Gisborne explored the valley

of the Sucubti; but he never found the gap in the mountains. A navigator or commander of some ship was said by Dr. Cullen to have seen the gap from his vessel at sea, but Mr. Gisborne and Lieutenant Strain had never seen it, and none of the Spaniards and Indians of old had ever found it. It might therefore be concluded that it was known only to Dr. Cullen. The first man (Vasco Nuñez) who crossed the Isthmus and discovered the Pacific Ocean in 1513, passed across almost the very land described by the paper, and persons continued to cross that very region in search of gold for more than one hundred and fifty years afterwards. They then gave it up for the Panama route in disgust, simply on account of the difficulty of crossing, but not before it had been thoroughly tested by Indians and Europeans. The city of Panama was established, and since that time the great transit route between the Pacific and the Atlantic had been that from the Chagres river and Aspinwall to Panama. He would notice some extracts from the paper to which he had referred and which was dated 1754. It described seven distinct travelled routes over the Isthmus of Darien, and in close proximity to the course described by Dr. Cullen.

According to that paper, there was a military station at Chapi-gana. Gold was being washed at La Marea river. There were christianised Indians at Balzas, twenty-two Indian families, and at Tucuti, which was near, there were coloured people of Spanish extraction, twenty-five working men, and seven old men over seventy years of age. They washed for gold, and the chief had five male and five female slaves. Going up the Chucunaqui river (on Dr. Cullen's route), at the mouth of the Yaviza, there were twenty-three christianised Indians brought from the mountains by the Jesuit fathers ten years previously. Ascending Chucunaqui river to the small river Tupiza there was a road there to the northern coast (the Atlantic) to a place called Gandi or Acanti. Ascending the river for two days in small boats and walking two days more, the foot of the general range of mountains was reached, and in another day the ascent was made. It would be noticed that in the description of each of the crossings there was always mention made of the foot of the mountains, and of a journey of one or two days' ascent before the summit was reached. The paper in question then went on to say:

"There is then a descent to the head waters of the Gandi, which flows into the Northern Sea (Atlantic), and is inhabited by forty families more or less Indians. From Gandi the north sea is reached by boats in three hours."

This was crossing No. 1. Then came crossing No. 2.

"From the mouth of the Tupiza, following the Chucunaqui, is the mouth of the Tuqueza river, and ascending the latter in small boats, a landing is reached, inhabited by four families, and from this place in one day's walk the

mountains are crossed, and the small river Pito is reached, and following its banks for half a day its mouth is reached, which empties into the Northern Sea at the beginning of the Gulf of Darien, in front of the Mogote Pelado."

Next was crossing No. 3.

"From the mouth of the Tuqueza and following the Chucunaqui river two days, is found the Tabugandi river; one day on this to the mouths of the Sucti and another small river; there live ten families. To the North (Atlantic) you journey two leagues by land from Tabugandi to Sucti, following the Sucti river half a day's march on foot you arrive at the foot of the Cordillera, whence you march in one and half hours to Sucubti" (here the route came across that of Dr. Cullen), "which small river has its source at the foot of the Cordillera."

It was always "the foot" of the Cordillera that was mentioned. There was no gap described.

"One day's distance from the mouth of Tabugandi, following the Chucunaqui up stream, is the mouth of the Sucubti. The village of Sucubti is two days' journey in small boats. This village consists of twelve families, and on its rivulet, Ipeti, seven or eight families more. Following the river on foot for half a day you arrive at the foot of the Cordillera; from the foot to the summit is about half an hour's walk. Hence you can see the Northern Ocean, and from the summit you descend in half an hour to head waters of Agalatumate, hence in two and a half days' journey on foot you reach the village of the same name, and from here, embarking in boats; you reach the sea at Calindonia in half a day"—to the Atlantic.

The very expression used was "summit" and the summit there mentioned was the lowest which probably could then be discovered, and that after so many years' residence in Darien by Spaniards and Indians.

But still it was half an hour's walk from the foot of the mountain, after climbing up the valley of the Sucubti "on foot for half a day." That was Dr. Cullen's gap; the names would be found in his paper. It was nearly the same route as described by Mr. Gisborne, who made a survey, and also by Lieutenant Strain. Then followed crossing No. 4.

"One day's journey from Sucubti mouth up Chucunaqui to rivulet Moreti. Up thence one day you came to a place with eight families, who, in order to get to the Northern Sea by the river Nabagandi, in front of the Isle of Pines, spend two days, and the journey is very fatiguing."

In the paper from which he had quoted there were described seven distinct crossings of the Isthmus at Darien, at what were supposed to be the seven most feasible points for transit, and in all of which the mountain was met with. Dr. Cullen having searched the archives at Bogota, it was remarkable that he had not discovered the paper containing the account of these crossings. It had been in existence since 1754, and was published in the *Panama Star* and *Herald* of January 5, 1868. It must be presumed that the Spaniards, who were in possession of Darien for two hundred years, could find no better way of

crossing the Isthmus than at Panama, and therefore abandoned Darien. Their avaricious and enterprising spirit for gold, and their desire to cross the Isthmus readily, and to perform their holy mission to christianise the new world, would hold to the Darien route as long as there was any advantage in it. In the old paper, from which the account he had quoted was taken, the historiographer described in minute detail the mode of life of the inhabitants of Darien and its topography. The statement showed that he had examined the country foot by foot. Vasco de Nuñez, and the Spaniards after him, knew too well from experience that Darien was unhealthy, and difficult to cross; and the valleys on the two sides of the mountain were so pestiferous that they were driven to the crossing at Panama. Even that was not much better, as far as his (Mr. Wyatt's) experience went. Dr. Cullen laid great stress on the healthiness of the country. He (Mr. Wyatt) recollected that when he crossed the Isthmus for the first time the whole of the persons who came off the ocean steam-ship had to wait at Panama for nine or ten days, and nearly every individual was attacked with fever. It was curious to notice from morning to morning how many less persons came to breakfast at the hotel, and at last the number dwindled down to three. There were fifty-five cases of sickness and one death during that short time. He denied the correctness of Dr. Cullen's theory of the existence of the valley described; but, assuming it to be correct, Dr. Cullen was proposing to cut a canal through a summit of from 180 ft. to 200 ft. on his imaginary section. Supposing he cut through a summit only 20 miles long, then the work would be one of enormous magnitude. The canal would be of no use as a ship canal unless it went from sea to sea on the same level. Locking up and down would deter ships from using that route. There must be a clean cut through, as at the Isthmus of Suez. Assuming the above length of 20 miles, with a depth of only 180 ft., and a width of 120 yards at water level, as at Suez, there would be required the removal of 500,000,000 cubic yards of material, which would occupy 20,000 men 50 years, or 100 steam excavators for 50 years. If the cost were put at the moderate sum of 2s. per cubic yard (though it would be nearly 4s.), the expense would represent a sum of 50,000,000*l.* sterling. The material excavated would be equal to a cubic mass standing on an area equal to that of Hyde Park, and 300 yards high, or a pyramid 900 yards high of the same area at the base. The earliest capital would be increased fourteen times, and the mean capital four times; that was, assuming the work was done in a most rapid way, and under the most favourable circumstances. In *Harper's Magazine*, March, April, and May, 1855, there was

a very interesting description of Lieutenant Strain's expedition in 1853-4. He went to very great pains in finding a proper crossing, and a great amount of detail was given on that subject. The paper was also profusely illustrated. It would have been well if Dr. Cullen had given extracts from that paper, and also from the published reports of Mr. Gisborne, instead of giving so much of his own opinion and experience. It seemed to him (Mr. Wyatt) that the canal crossing of the Isthmus of Panama was a matter for posterity. There was only one way to get through the backbone of Darien or Panama, and that was to use the new machine which the Americans called the American railway constructor, which was described as a miracle in the way of excavation.

Mr. GORE said he knew a little about the Isthmus of Panama. His visits had been more extended than those of Mr. Wyatt, and he could fully corroborate all that that gentleman had said in reference to the Darien Canal. In 1857, while on his way to South America, he met at St. Thomas with General Muscau, who was then President-Elect of the United States of Columbia. On passing from St. Thomas to his (Mr. Gore's) destination at Carthagena, much of his time was expended in discussing that particular subject with General Muscau, for the general had a very strong feeling against the continuation of the charter as granted by the republic to the United States. They considered that they had made a very bad bargain, and they were very anxious, as far as possible, to rescind that contract, or otherwise to promote something that would act as a competitor with it. He informed him (Mr. Gore) that the government had undertaken a variety of surveys totally independent of those which had been undertaken by the English and American engineers; and in so many words, he stated exactly what Mr. Wyatt had stated, namely, that the happy valley which Dr. Cullen had discovered was certainly not discoverable in any point approximate to the Isthmus of Darien. It would be scarcely necessary to discuss the Darien question if persons were acquainted with the profile of the Pacific Coast, the nature of the bay in which the author proposed his canal should terminate, and those peculiar difficulties which were connected with the construction of heavy earthworks in that locality. Dr. Cullen proposed to make his Pacific terminus in the Gulf of San Miguel. The whole of the Bay of Panama was continually silting up. In 1857, a steamer of 800 tons burden could come within a comparatively short distance of land in the Bay of Panama; but now the Pacific Steam Navigation Company had to disembark their passengers opposite an island. The silting up was caused by the wash which occurred from the range of mountains to the

northwest of the route, and also by the wash which was brought in by the North Pacific Ocean. He (Mr. Gore) was connected with a company in Chili whose intention was to use San Miguel as a port of embarkation, but it was found that a vessel of over 600 tons burden could not be got within three miles of the coast. The whole of the water was shoal water, and the canal would have had to be dredged three miles from the beach to enable vessels to pass through or lie at anchor. Another serious difficulty in connexion with San Miguel Bay, was the prevalence of shoals and rocks in what might be called the bight. But supposing the engineering difficulties were surmounted, and there was a bay sufficiently capacious, and with good anchorage and ample water space on the Pacific side, what would be the consequence of the bay on the Atlantic side? Those who had navigated the Atlantic side, especially of the Caribbean Sea, knew that it was fast silting up, and that many vessels which could some time ago lie at anchor there, were now obliged to discharge at new ports. What had taken place in the year 1866, in connexion with the Tehuantepec route would corroborate the statement as to the fallacy of the Darien scheme. The imperial government granted the ratification of a concession of a railway across the Isthmus of Tehuantepec in opposition to a concession which had been granted by the republican government to a company which had been formed in New Orleans. A staff of engineers had surveyed several points along the line, and one of them, Colonel Murphy, went to see this identical spot. The answer was, that it was perfectly ridiculous to commence a survey, as the obstacles were so great that no capital that any company could raise would be sufficient to carry out such an affair. It was an Englishman who made the report. He (Mr. Gore) thought that if it was essential that there should be a ship canal from ocean to ocean, some notice should be taken of the Tehuantepec route, that it should not be dismissed in so cavalier a manner as Dr. Cullen had dismissed it in the paper. It had some points which were worthy of consideration though all the crossings presented some difficulty as regarded the want of water for locking. To attempt to cut a canal without locks was impracticable, and therefore the route should be selected where the water supply was sufficient to make up for waste by lockage.

Mr. Moss said that he had given a little attention to the various projects for a railway from sea to sea, and to the general great importance of carrying traffic across the Isthmus. In the United States they were doing quite enough for the passenger traffic, and, perhaps, for the light freight. There would be two roads across in three or four years undoubtedly; but it struck

him that, somewhere in the centre of the continent, there ought to be a canal. The best route which he knew was the one from Chiriqui. That was proposed forty years ago on the Atlantic side. Since that time there had been almost entire silence on the subject. It was useless to talk about the transit across the continent unless commercial harbours could be formed. A central route for ships, such as was proposed by the author of the paper, would be a great advantage to the commerce of the world, and was becoming more and more important every day as the settlements along the Pacific side were increasing. The islands of the Pacific were also becoming more and more important every year; and hence he was very glad to see the question of a canal taken up by a body so competent to examine it as the Society of Engineers. As a citizen of the United States he felt a very great interest in the subject. The matter was one of international interest, and he believed that the time would soon come when the great commercial powers of the world would decide that no one nation should be allowed to interpose a barrier to the crossing of the Isthmus either by railroad or canal if a suitable route could be found for the purpose.

Mr. LARGE said that it seemed to him that the main difficulty in the scheme was the lockage, in consequence of the altitude of the country between the two oceans. He wished to know what the altitude was.

The PRESIDENT said that Dr. Cullen gave 180 ft. of cutting, and Mr. Gisborne gave 930 ft.

Mr. LARGE said there was a wide difference between the two. The question was whether Dr. Cullen had taken the altitude by an aneroid barometer, as estimates based on such observations were erroneous.

Mr. WYATT said that Dr. Cullen had not taken any levels by the barometer or any other instrument.

Mr. LARGE said that he had heard of many attempts to cross which had not succeeded. The water in the Gulf of Mexico was very shallow, but perhaps that difficulty could be overcome, as in the case of the Suez Canal, by extending piers into deep water.

Mr. WYATT said that it was an unfortunate thing for the commerce of the world, that a great difficulty had crept in lately with respect to the Isthmus transit. There was an arrangement between the Panama Railway Company and the Government of New Grenada, that for many years to come the Railway Company should have the exclusive right of crossing the Isthmus. Whoever sought to cross the Isthmus by a rival project for the benefit of the commerce of the world, must now indemnify, and pay off the Panama Railway Company, at

a tremendous sacrifice. Their line paid about 25 per cent., and was a most valuable property.

The PRESIDENT asked Mr. Wyatt whether, in his opinion, a canal would succeed from ocean to ocean at a lower level than the mean of the oceans.

Mr. WYATT said that the canal must go to the lower or sea level to be of any use to the commerce of the two great seas of the world. Anything less than that would appear to be useless. Locks were a very great impediment to traffic, and especially on a shipping canal. In such a case they would amount to a prohibition of commerce. It would be better to have a railway and tranship the goods, than go through the locks of a canal. Imagine a large portion of the commerce of the world going up and down a locked canal where only one ship could pass at a time! It would be perfectly absurd. It would not carry the traffic, now going from one ocean to the other by the railway, which was not a tithe of the commerce there should be passing from the Atlantic to the Pacific, although the Panama Railway Company paid 25 per cent. out of their one train each way per day. He considered that it would not be worth while to carry out a scheme for a canal, unless locks could be avoided, as it could not pay.

Mr. BRYANT asked Mr. Wyatt if he knew whether there was any difference between the levels of the two oceans.

Mr. WYATT said that practically speaking there was no difference between the levels. The mean levels of the Pacific and Atlantic were identical. That showed that probably there was a subterranean communication between the two oceans. There was an extreme tide in the Bay of Panama ranging from 16 to 20 ft., while in the Atlantic the maximum was about 18 in. only. The difference of the tides was due simply to the peculiar currents, and configuration of the coasts of the two oceans. A person observing such difference of tides in two oceans so near together was led to become incredulous of the doctrines of Sir Isaac Newton, and to suspect that the moon had nothing whatever to do with the tides. On the Pacific coast of Salvador, the spring tide did not rise more than 10 ft. There were phenomena in respect to the tides in this part of the world which no one could comprehend or explain. They were much influenced by the local circumstances of the two oceans.

The PRESIDENT said that he was sorry Dr. Cullen was not present to answer the objections that had been raised against his scheme. There could be no doubt that a ship canal for connecting the great Atlantic and Pacific Ocean, through some point of the Isthmus of Panama or Darien, would be a very desirable undertaking. To our country it would offer very great

facilities of access to our colonies, Australia, and New Zealand, and would greatly facilitate our trade to China, Peru, and the Spice Islands. It would likewise be an advantage to all the trading nations and maritime powers of the earth, and therefore, as Mr. Moss had said, the question was one of an international character. Unfortunately the Cordillera on the one hand and the Rocky Mountains on the other, seemed to interpose an insuperable barrier to such a work. It seemed that Dr. Cullen had in his own mind struck upon what had been called "a happy valley," through these formidable mountains, but it certainly appeared from what had just been said, and from what had been said in other places, that there were not sufficient reasons for believing that such a passage existed. The author was about setting out on a journey to make further discoveries in these countries, and he (The President) trusted he might be successful in obtaining such information as would warrant the hope that we might some day see a cut made through the Isthmus which divided the two oceans. While the present Emperor of the French was an exile in England, he took part in a discussion at the Institute of Civil Engineers, on a scheme which was proposed for crossing the Isthmus through the lakes Nicaragua and Leon. It was then considered that that route offered facilities which no other route afforded. They conceived that by the crossing of a shipping canal through this Isthmus, the line of the canal would become a centre of commerce for a very large district, and that the two lakes containing a large amount of water could be used as docks, and so afford advantages which no other scheme would comprise. It was also thought that there were a number of navigable rivers extending some distance into the surrounding country, by means of which the commerce might be rapidly distributed over the two continents.

into mere ceremonial, never limited itself to the hopes and fears of a future life, never forgot to fashion human character on Christian models. Having its hands free, as nowhere else, our religion has used doctrines to produce practical results in human behavior. The results appear in the economic value of a man of this race; as an inventor, a master or a workman; as a merchant or a ship captain or a clerk or a sailor; he is apt to have in him some reserve of invisible power; and in one or another form such power is the cause of wealth, in modern societies. If the Anglican peoples are the most wealthy—and no one doubts it—the greater freedom with which our religion has acted upon the practical mind of our humanity is the obvious explanation of this superiority. The individual man whom we may have under examination, may not be a Christian by profession; but he has inherited from a Christian ancestry the qualities—all moral at their root—which make him an economic force.

This economic order has followed the political order in being one of liberty. Against some results of liberty in the order of wealth, a protest has grown into considerable strength in the last twenty-five years. The freedom of the strongest in a world of production tends to make others his servants; and strength has found new means of fraud upon weakness. A movement to check such evil tendencies began among Christian people as soon as the evils attracted attention; and the mal-distribution of good things will be doubtless checked as far as possible with the hearty support of the influence of our religion.

But the careless observer may miss the present value of Christianity in the economic world by a too ready belief in every charge of injustice, and by overlooking an important part of the case. Of one thing we are perfectly confident. If at any time—or at this time—you have convinced the Anglican Christian mind that JUSTICE requires any specific legislation in restraint of the rich, that legislation will soon be on the statute books. Nay, if from obscure springs evils are flowing, these hidden springs will be

searched out. For my part, I could feel no such confidence in a non-Christian people. To prevent oppression by the rich, the English Parliament began early to build up fences of law; and it has never ceased to build them.

The English Church has often been the first to demand such laws, and its moral weight has always been on the side of the poor. Let me illustrate by one of the earlier forms of check. It is a prayer appointed to be read in all the churches, during the reign of Edward the Sixth. It is valuable evidence because it breathes the very spirit of English Christianity; and because this prayer was read before rich and poor alike, the church in this way reminding the rich of their duties in the presence of the poor. All England heard this prayer; and I am confident that its effect surpassed that which the best possible law on the subject could have produced. Here are the words of this prayer:

"We heartily pray thee to send thy Holy Spirit into the hearts of them that possess the pastures and grounds of the earth, that they, remembering themselves to be thy tenants, may not rack or stretch out the rents of their houses or lands, nor yet take unreasonable fines or moneys, after the manner of covetous worldlings; but so let them out that the inhabitants thereof may be able to pay the rents, and to live and nourish their families, and remember the poor. Give them grace also to consider that they are but strangers and pilgrims in this world, having here no dwelling place, but seeking one to come; that they, remembering the short continuance of this life, may be content with that which is sufficient, and not join house to house, and land to land, to the impoverishment of others: but so behave themselves in letting their tenements, lands and pastures that, after this life they may be received into everlasting habitations."

There speaks the voice of English Christianity, and that voice is still heard all over Angledom. And, as I think, there is no other force in all the world which has had, or now has, a tithe of the restraining power of this Christian pleading against strength and for weakness.

There is, however, a large fact in the distribution of wealth—as it is effected in English production—which is wholly obscured by our current discussions. The fact re-

ferred to is that the large wealth could not exist if a considerable part of it did not flow through the main body of the people. Modern wealth outruns all ancient dreams in its vast proportions. But this aggregate includes all the less and the little as well as the great; and *the great could not exist without the less and the little*. If that nightmare of our fancy, the absorption of all wealth by a few, should become a living reality, it is certain that the increase of wealth would come to a sudden end. The multitude *as a consumer* is the cause of modern wealth; and that means a wide and large enjoyment of the gains of a *régime* of Liberty. The emancipation of our slaves created fortunes by making the slaves consumers on a larger scale. So, a wide diffusion of the blessings of abundance has followed from the Christian instruction and inspiration which have made Anglicans industrious, inventive, frugal, patient, and assured of the future. The belief of collectivists that we might dry up these springs of vigor and endurance, and still have all the abundance, is certainly not supported by any evidence.

I must not hesitate to affirm that English Christianity has wrought its great work in creating English wealth by moving upon the

deep forces of character, and by giving character a free course. In other words, commercial and industrial liberty is the offspring of English religion. No socialistic scheme of binding Samson that he may grind in our mills can satisfy our Christian ideals. We know that he will grind better in freedom; and we hope to be able to see to it that he does not use his great strength to slay us and our children.

The Christian task in economics remains, that which John Wesley achieved in his time, to stimulate and educate productive energy. Many thousands in every generation are not reached and inspired. Could we reach them there would be vastly more wealth. The men who fail in industry, in prudence, in frugality, in self-restraint, do not fail under Christian inspirations but for lack of them. It is not the fault of our religion that they are poor, that they throw away their gains in Wall Street or in saloons, that they live beyond their means or make unwise investments. The stimulant force which Christianity has imparted to a large portion of the Anglicans would create plenty beyond the dreams of socialism if it could reach, inspire, restrain the entire population of the English-speaking world.

UNDERGROUND RAILWAY IN LONDON.

BY A. E. DANIELL, B. A.

THE vast extent of London and the ever increasing number of persons of all classes living at a distance from the scene of their daily work, rendered it—some five and twenty years ago—necessary to supplement by a system of railways the slow and inadequate method of communication afforded by the omnibuses, which were then the only means of locomotion available to that great majority of Londoners for whom the expense of constant cab-hire is prohibitory.

The idea of an elevated railway would not be tolerated in London; it would be considered as an outrageous disfigurement

of the streets, and its proximity to the housetops would be denounced as an unwarrantable violation of the rights of property. Consequently, the promoters of this great scheme were reduced to the necessity of tunneling under the roadway, and there laying their lines.

As years went on the amount of public patronage extended to the undertaking evoked the construction of numerous branches connecting the suburbs with the metropolis, and so quickly do the various trains now succeed each other in the more important stations, that it requires a cool head and a sharp eye on the part of the

traveler to avoid stepping into a wrong one and finding himself landed two or three miles from his destination.

The main line is constructed in the form of a circle, so that a person may enter the train at one of the city stations, and having revolved round London, return by a different route to his original starting place. Oddly enough, this "Circle," which seems quite the embodiment of harmony, is not the property of a single company. It is about equally divided between two separate—and in fact bitterly antagonistic—companies, the Metropolitan Railway Company and the District Railway Company, which are, however, in this particular instance, compelled by Parliament to sink their mutual animosities and work together for the benefit of the public. Each of these companies has some branch lines, but the Metropolitan—whether by better fortune or better judgment—invariably contrives to make a much larger profit out of its business, and and is accordingly the *bête noire*¹ of directors and shareholders of the less prosperous District.

On the "Circle," the trains run every ten minutes in the day and early evening, but later on they are restricted to every twenty minutes. The number of trains on the branch lines varies, regard being had to the respective needs of the different suburbs. By about midnight all traffic has ceased, but it recommences at a very early hour in the morning, when trains specially provided for workmen may be seen crowded with the sons of toil eager to begin the labors of the day.

In the outskirts of the town, when sufficient vacant ground existed to allow of these lines' being constructed on the surface of the earth, this mode of progression is not wholly unpleasant, but it is far otherwise in those central districts, including nearly the whole of the "Circle," where the line burrows beneath the soil. No one, who has not already endured it, can conceive the miseries which the unhappy passenger has to bear.

To the chiefly negative discomfort of utter darkness, relieved only by a lamp

of the feeblest description, generally out of order, and always so adjusted that its light may give the least possible amount of benefit, is added the indubitably positive torment of an atmosphere of almost unparalleled noisomeness. The air is densely charged with myriads of sooty atoms which settle, like swarming bees, on the face, hands, and garments of the traveler. His eyes smart and water with the sulphurous vapors caused by insufficient ventilation, while his throat becomes choked with the inky particles which he is constrained to swallow, and his body is convulsed by the coughs which ever and anon break from him, as he vainly endeavors to dislodge the abominable mass of nastiness which oppresses his lungs. If he keeps the window closed, the foul air is almost suffocating; if he opens it, he is at once exposed to a fresh inroad of sulphurous fumes and volatile dirt. In fact, take what precautions he may, the journey is not conducive to his health, his personal appearance, or his mental happiness.

Why, then, it may be asked do so many people use such a noxious method of locomotion? The truth is, they cannot for the most part help it. In these days of rush and bustle, people must get to and fro as quickly as they can. Everything else is but a secondary consideration. The multitude of trains and abundance of stations present advantages which outweigh the sensations of comfort and cleanliness, and judges and laborers, merchants and counterjumpers, aged men and callow youths, delicate women and children of tender years, are all to be daily seen in the Cloaca Maxima² of the modern Babylon.

The stations are furnished with book stalls, which do a brisk trade in the morning and evening papers, and display a variety of novels, medical compendiums, guidebooks, and political pamphlets; these works, however, are far less in demand by passengers than the "Star," and, on Saturdays, the "Pink'un." It is sometimes possible to obtain a little useful information by turning over the leaves of a book on these stalls, but, as the custodian will probably

pester you to buy it before you have read a dozen lines, this manner of searching after knowledge is precarious, and liable to untimely interruption.

The automatic craze is very much in vogue at these stations. You can weigh yourself automatically, take your own height automatically, obtain sweets, cigarettes, matches, and scent automatically, on depositing a small coin (*i. e.*, one penny) of the realm, in the gaping slot. Refreshment bars are few and far between, being attached to only the most important stations, and even these are hardly worthy of eulogy.

The advertiser is in full force. Photographers hang over the benches those curious frames in which three startled-looking young women, an expressionless baby, a stern bald-headed gentleman, and a soldier in full uniform, are exhibited as specimens of their skill; enterprising bakers affix to the walls cases containing white and brown loaves, with testimonials from physicians of eminence proudly inscribed below; haberdashers stick up little receptacles in odd corners, wherein they stow a shirt and two collars, with a legend to the effect that these articles of apparel present a unique combination of fashion, cheapness, and durability. But the great bulk of the advertising is done by means of boards and tablets, which are ranged about the walls in every available space. Puffs theatrical, puffs journalistic, and the ubiquitous soaps and pills, are massed in a dense phalanx, while that awful example of perverted ingenuity, the electric sign, performs its exasperating gymnastics.

To such an extent is this system of placards carried on that it is often extremely difficult to distinguish the names of the stations among all this superfluity of printed matter. Not long ago an American traveling on the "Circle," seeing "Partington," the name of an eminent advertisement contractor, painted in enormous letters, concluded that this was the name of the station. When he arrived at the next stopping place, he again observed "Partington," emblazoned in the same conspicuous manner. This somewhat surprised him, but he

consoled himself with the thought that there must be two divisions of the "Partington" station; so he continued his journey and shortly afterwards arrived at "Partington" the third. Unable any longer to satisfy himself as to the mysterious recurrence of these letters, he proceeded to make inquiries, with the result of discovering that, misled by this Will of the Wisp, he had gone two stations beyond the place where he had intended to alight.

The pertinacious advertiser does not stop at overloading the walls and every inch of space in and about the stations, but he goes so far as to afford the companies additional means of revenue by disfiguring the higher portions of the carriages with small tablets, which constantly appear before the eyes of the martyred traveler, setting forth exaggerated panegyrics on building societies, patent shoe blackings, quack medicines, and other equally unimportant nostrums.

The carriages on the trains are divided into three classes, first, second, and third. The first-class compartments are comfortably padded, the second are in a sort of intermediate state, while the third are mere boards. The number of persons that can be seated in each compartment is ten—five on each side—but in the third class, at busy times of the day, as many as six people often squeeze in on each side, and it is not unusual to see, in addition to these, three or four men or lads standing in the narrow gangway between the seats. A goodly proportion of this crowd are frequently loaded with bags of tools, unwieldy packages, bundles, and tin cans, and the effect on a sultry July evening when they are all perspiring freely, especially in a smoking-carriage, enveloped in clouds of the rankest "shag-tobacco" propelled from the vilest of pipes, can be more surely conceived than described.

The carriages are not provided, except in solitary instances, with any heating apparatus, and when they are so furnished—which usually occurs in the first-class—a solitary warming-pan about three feet long constitutes the sole calorific agent during the severe frosty weather.

As a rule when traveling in a "Circle"

train and alighting at your destination, it is found necessary to climb a steep and dusty staircase of about twenty or perhaps forty feet from the landing platform before reaching the street.

The pretty and truly picturesque stations at the junctions of the thoroughfares on the elevated system, in New York City, and on the suburban lines throughout the United States, are in marked contrast to the shabby and soot-covered places where one waits for a train in London. Huge glass domes cover the space allotted as a depot, underneath which passengers must either walk or stand upon the dreary platforms or else be content by occupying a hard circular seat arranged against the tomb-like walls of the "Underground."

Then again the telegraph offices are missing at these stations. A person wishing to despatch a "wire" cannot do so at the railway ticket offices, this monopoly being a separate and distinct institution, and solely under the control of the government. Hence it is obligatory to send all electrical communications from branch post offices.

The first-class fares are about double those of the third-class; the second about half way between the first and third. Return tickets can be purchased at the rate of a fare and a half for the double journey, and first- and second-class season tickets can be procured at advantageous terms, a privilege of which business men who have to travel on the line daily, are not slow to avail themselves. There is a considerable number of unscrupulous travelers who, after taking third-class tickets, usurp positions in the first- and second-class carriages to which they are not entitled. These interlopers are, however, sometimes detected by zealous officials who occasionally make an inspection of tickets *en route*, and then their confusion is very amusing to witness.

Tickets are taken by a collector standing in a narrow passage or angle, which must be passed in order to go out of the station. He is so placed that only one person can get by him at a time. It is thus not easy for a person without a ticket to avoid his vigilance. I once, however, saw a success-

ful attempt of this kind made on a dark winter's night at the Edgware Road station, which is situated among a network of small streets. A man, getting ahead of the crowd of out-going passengers, rushed violently up the stairs, and, dashing past the astonished collector, who vainly endeavored to seize him, disappeared in the adjacent labyrinth shrouded by the most unusual gloom. The collector said he should know him if he saw him again; but whether he did so or not, has never been ascertained.

Of course, when there are so many stoppages, the amount of time which can be spent at each station is extremely short, and an unpracticed passenger who wanders deliberately along the platform, eying every carriage with care so as to select the most commodious, will probably be startled by the sudden motion of the train and run a risk of being left behind. This is often the case with elderly ladies, who sometimes scramble with outstretched arms, in terrified haste, into a carriage full of smokers, while the alert guard gives them a push behind and claps the door upon them with a tremendous bang.

The polite attention passengers receive on the American lines from the employees is missing here, as the porters, guards, ticket-collectors, and booking-clerks spare no time to give courteous replies to any inquiries, or in directing passengers how to find their proper trains; but if a small tip, say twopence, is handed to one of these servants, a ready reply will be vouchsafed or you may be conducted either to the right platform or even guided to your train and have the door of the compartment shut quietly after you.

The agility of the guards—a fine athletic set of men—is very noticeable. They give the signal for departure by waving a green flag, shut all open doors with a powerful turn of the wrist as the train rolls by them, and when its speed has become considerably accelerated, make a dart at the foot-board, and clutching the door swing themselves into their vans with a precision which excites the envy and admiration of spectators.

The enormous strides which are now being made in electrical science may prove to be

the means of eventually solving the question, how to establish a speedy method of communication throughout London without the deleterious atmosphere engendered by the smoke of the present underground railway.

A small electric railway has already been constructed, starting from the city and going under the Thames to the southern bank of that river, whence it proceeds to the populous suburbs of Kennington and Stockwell. Access is obtained to the platform by means of lifts, and the traveler is elevated to the surface by similar agency when his journey is done. Though this line may be regarded chiefly in the nature of an experiment, it is certainly very popular in the districts through which it passes, as

may be seen from the busy throngs which hurry to its stations to make use of the facilities thus afforded for getting to their place of work; and a much greater scheme has already received the sanction of Parliament—though it has not yet been actually begun—viz: the construction of an electric railway from Shepherd's Bush, a western suburb of the metropolis, which would run under the Uxbridge Road, Oxford Street, and Holborn to the city, where it would form a junction with the line already existing. This is a great idea, and it would extend railway facilities to the only central parts of London which are still imperfectly served. All Londoners trust that no obstacle may arise to prevent its speedy execution.

GUSTAVUS ADOLPHUS.

BY MAX LENZ.

TRANSLATED FOR "THE CHAUTAUQUAN" FROM THE GERMAN "PREUSSISCHE JAHRBÜCHER."

PROTESTANT Christendom is now preparing to celebrate the memory of the northern hero who, in the darkest days of Germany, came forward in the turmoil of most bloody battles, as the redeemer of the imperiled adherents of the Lutheran creed. The political strife of nearly three centuries ago has died away. The German nation, no longer divided and wavering, stands to-day powerful and united, determined to ward off every attack. Long since have the foreign powers who fought out their fights on German soil and took possession of our territory and streams departed, driven away, shaken off, and Sweden even among the first. The old boundaries have been recovered and more faithfully fortified, and alien splendor has faded before the light of the new German crown.

Yet the religious dissension is still perceptible. The modern followers of the old faith of the Middle Ages are disposed to depreciate even now the glory of the great king, because of his hostility to their cause at the beginning of the seventeenth century. It seems as though our defenders of Rome and the papal policy had gone too far to-

wards the justification of the past. Their complaints are directed against the political views which were bound up in Gustavus Adolphus with the zeal of his religious belief. From the heights of national self-consciousness they condemn the selfish policy of the foreign conqueror, and forget in their patriotic agitation that the historians of the new school are bent on nothing less than to justify historically the aims of the House of Hapsburg and the pope, and decry the new state which incorporates German Protestant ideals.

There has scarcely been a period in German history, when the old empire attained greater successes and came nearer to the restoration of religious unity than in the years when Wallenstein and Tilly¹ fought their great fights, and Emperor Ferdinand was preparing, with the aid of the League,² to revoke all promises and treaties the German Protestants had wrung from his family. When, at the end of 1627, the last Danish garrisons were driven out of Mecklenburg and the Cimbrian peninsula, it seemed all over with German heresy. The imperial general had become master of the land as far

SIXTH ORDINARY GENERAL MEETING.

The Sixth Ordinary General Meeting of the Session was held at the Whitehall Rooms, Hôtel Métropole, on Tuesday, April 12, 1904, when a Paper on "The Development of West Africa by Railways" was read by Fred Shelford, Esq., B.Sc. (Lond.), M.Inst.C.E.

His Grace the Duke of Marlborough, K.G., presided.

The Minutes of the last Ordinary General Meeting were read and confirmed, and it was announced that since that Meeting 20 Fellows had been elected, viz. 7 Resident and 13 Non-Resident.

Resident Fellows :—

Charles Weldon Adams, Daniel Finlayson, F.L.S., Francis Douglas Fox, M.A., M.Inst.C.E., Hugh Spencer Lynn, His Grace the Duke of Marlborough, K.G., Bernard Oppenheimer, John S. Remington.

Non-Resident Fellows :—

Hyman Boodson (Transvaal), Godfrey T. Bradley, M.I.Mech.E. (Ceylon), Edward L. Brockman (Straits Settlements), Donald A. Grant (New South Wales), Edward M. Hixson, C.E. (Gold Coast Colony), G. Frederick Hoy (Cape Colony), W. G. Hutchinson (Transvaal), Ernest H. Mitchell, A.M.Inst.C.E. (Gold Coast Colony), William Murray (Gold Coast Colony), James Peet, M.I.Mech.E. (Trinidad), Reginald D. Pontifex, Ernest G. Stevens, C.E. (Sierra Leone), Charles Tatham, J.P. (Natal).

It was also announced that Donations to the Library of books, maps, &c., had been received from the various Governments of the Colonies and India, Societies, and public bodies both in the United Kingdom and the Colonies, and from Fellows of the Institute and others.

The CHAIRMAN : I have much pleasure now in asking Mr. Shelford to address us. He is well known to many of you. Mr. Shelford is connected with the firm of Messrs. Shelford & Son, who are consulting engineers to the Crown Agents for the Colonies, a distinguished firm, who in the past have done very good work both for the Colonial Office and for others in this country. He himself has visited many of the territories concerning which he is about to

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speak, and indeed I believe that with regard to railway construction he has been a pioneer in having examined the country and the land where subsequently the railways have been constructed. Speaking for myself, I come here as a pupil, as one who is anxious to learn all he can from the information the lecturer is about to impart to us.

Mr. SHELFORD then read his paper on

THE DEVELOPMENT OF WEST AFRICA BY RAILWAYS.

THE development of a country largely unexplored and still little understood, such as West Africa, in the Author's opinion comprises:—

1. The suppression of tribal revolts and intertribal warfare, and the abolition of slavery and other barbarous customs, by the introduction of an enlightened administration, *i.e.* pacification.
2. The introduction of the teachings of Christianity in place of the superstitions and cruelties of paganism, *i.e.* religion.
3. The establishment of the importation of manufactured goods in exchange for the exportation of the natural products of the country or those obtained by cultivation of the soil, *i.e.* trade.
4. The location and working of mineral ores, affording paid occupation and education for the native and the employment of capital, *i.e.* industry.
5. The instruction of the native in skilled labour, arts, science and literature, enabling him to become a useful subject of the Empire, *i.e.* education.
6. The geographical, topographical, geological, zoological, botanical, and ethnological study of the country.

These results are brought about in a greater or less degree by such means as European administration, military and exploring expeditions, the efforts of missionaries, mercantile enterprise, and mining operations, but each and all of them are assisted and expedited by the establishment of improved means of communication, such as is provided by the construction of railways.

In the Colony of Sierra Leone the native insurrection in 1898 was accompanied by the most terrible outrages upon the Europeans within the affected area, and unfortunately found the Sierra Leone Railway only recently begun and of use for only a short distance for the conveyance of troops; but at the present time with the railway in working order from Freetown, the capital, through Songo Town (32 miles), Rotifunk (55 miles), to Mattru and Bo (135 miles),

and an extension from Bo to Baiima (222 miles from Freetown) rapidly approaching completion, there can be no doubt that any further native rising in the neighbourhood of the railway is improbable, while the means of communication now afforded by the railway would lead to the prompt suppression of any revolt which did occur, since troops could reach the infected area from the seat of Government in a few hours.

Again, in the case of the Gold Coast the numerous wars against the Ashantis in 1875, 1896, and lastly in 1900, each of which has been most costly to the Mother Country in life and treasure, are unlikely to occur in future now that Kumasi is placed within sixteen days' journey from England, and a few hours' journey from the coast.

At Lagos fortunately the inhabitants of the hinterland are more advanced in the Imperial scale than at Sierra Leone and the Gold Coast, and the railway is unlikely to be called into use for the suppression of disturbances, while the connection by railway of Lagos with the great native towns of Abeokuta and Ibadan has only to serve the purpose of promoting trade between those important centres.

If the extraordinary expenditures upon wars, which the Colonies can ill afford, can be avoided altogether in the future, and at the same time commercial relations be strengthened by the construction of the West African Railways, they will be of lasting benefit to the Colonies that own them.

Inter-tribal wars, with the attendant feeling of insecurity and reduction of the population, barbarous customs—such as human sacrifices, massacres of prisoners of war or of slaves, and other inhuman practices due to the influence of “fetish”—are bound to give way before the advance of railways and the increased facility of travel afforded to officials of the Administration.

The encouragement to trade afforded by railway construction of course requires no demonstration. It will suffice to say that the natural products of the country—such as palm oil, kernels, rubber, &c.—which have in the past been allowed to remain untapped for want of means of transport, have been now, and will be still more in future, brought within reach of the merchants on the Coast. What is desired in this respect is for the West African trader to see his way to further efforts to secure the collection and sale of these valuable products by the establishment of subsidiary stores upon the route of the railway for the exchange of native produce for European manufactures.

With regard to the cultivation of the soil, the construction of railways has opened up very large tracts of country suitable for the growth of almost every conceivable tropical product. Much has been recently heard of Imperial-grown cotton for the use of the Lancashire mills. The Author can only point to the large tracts of land in Sierra Leone and at Lagos, many of which are suitable for the cultivation of this plant, now opened up by means of the railways, and waiting for properly-directed efforts to turn them to account. It is for such objects, among others, that the Governments of the West African Colonies have undertaken the responsibilities of railway construction.

The prospecting of the country for mineral ores is, of course, facilitated by railways permitting a wider range of operations.

With regard to the actual working of mines, gold is the mineral which has first attracted attention in West Africa as elsewhere.

Gold mining is an industry which has necessarily to deal with large quantities of quartz requiring pulverisation to a high degree of fineness, and for this purpose stamps or rolls of great weight must be employed. Stamps weighing from 750 lbs. to 1,100 lbs., or even more, can only be subdivided into two or three sections, and a battery of any considerable output may require from 20 to 100 or more of such stamps.

Sectionalisation of mining machinery has sometimes been adopted under stress of circumstances where no transport facilities existed, but all mining engineers are agreed that it is essentially unsatisfactory on account of the loss of sections in transit, and the inability of sectionalised machinery to withstand the vibrations to which it is subjected.

The transport of heavy pieces of machinery, anything in fact over one or two cwt., for any long distance, or anything over half a ton for the shortest distance, is a practical impossibility in a country such as the Gold Coast, where the rivers are not navigable and roads exist only in name. This is conclusively proved by the past history of gold mining on the Gold Coast. The gold miner must therefore either sectionalise his machinery with the consequent sacrifice of efficiency, or he must be provided with means of transport.

The Gold Coast Railway delivers loads of any weight at Tarkwa, one centre of the gold-mining industry, in a few hours, while it delivers at Obuassi, the headquarters of the Ashanti Goldfields

Corporation, machinery such as could otherwise not be employed there.

Other mining industries than gold mining are undeveloped in West Africa. Unfortunately, so far coal has not been found, although the condition of the forest belt of West Africa seems to be very similar to that existing in Europe during the carboniferous period. Gigantic trees, innumerable smaller trees, and dense undergrowth quickly grows and falls to the ground to rot, forming a deep layer of decaying vegetation, which one can well imagine may form a carboniferous stratum in future ages. It is a question, however, whether the conditions of damp and heat and the presence of white ants and other insects may not be destroying the timber before it becomes permanently imbedded. This, however, is merely a matter of academic interest to the present age.

The education of the native in the practical arts and crafts is a most important effect of the introduction of the iron horse, although railways share this influence with mining operations and other industries. The native if left to himself will learn nothing and will aspire to nothing but the simple husbandry of his forefathers, which supplies him with his food and a small surplus of products for exchange for clothing, gun and gunpowder. But when railway construction is begun he is called upon to assist in surveying, clearing of forest upon a large scale, excavation of cuttings in earth, and blasting of cuttings in rock, building of embankments, excavation of bridge foundations, construction of masonry or concrete bridges, and erection of steelwork, erection of station buildings, workshops, quarters and telegraph, laying of permanent way and ballast, each of which, together with many other branches of the work, must educate him and advance him in the scale of civilisation.

But the railway when constructed has still to be worked, and this again demands for the native the duties of maintenance and repair of road, bridges, stations and rolling stock, while from the ranks of the natives have to be enrolled station masters, drivers, firemen, fitters, blacksmiths, guards, porters, shunters, and pointsmen; while both during construction and during working a small army of timekeepers, bookkeepers, clerks, typewriters, and accountants has to be enlisted from the native races to avoid the expense of excessive European skilled labour.

The different native tribes show varying adaptability to the new duties demanded of them. Considering the absence of any real necessity for continuous wage-earning employment the natives

have taken fairly well to the work, but there is plenty of room for improvement. There is no reason why in time the West African native should not attain the same degree of proficiency as the East or West Indian.

Improved knowledge of the geography and topography of West Africa has naturally followed as a result of the numerous surveys carried out to determine the route for each railway. Some 750 miles of surveys have been carried out in Sierra Leone alone in connection with the railway, and a large number of names of new towns and villages have been added to the map of the Colony. At Lagos also numerous surveys have been made and the topographical knowledge of the country has been improved, while upon the Gold Coast the railway runs from Sekondi to Kumasi through country previously quite unknown. The Author's own expedition between the two places in 1899 and the numerous prospecting expeditions sent out in 1900 and 1901 have, it is hoped, contributed to the geographical knowledge of this part of the Gold Coast.

The construction of railways facilitates the study of the geology and botany of a country by affording continuous though shallow sections difficult to obtain otherwise, while the use of native timber brings to light unknown trees of commercial value. Each, however, of these services requires systematic application by itself, and it is difficult for railway construction staffs to do more than take advantage of any discoveries of practical value that they may happen to make. Thus the position of a deposit of river gravels is quickly noted for use for concrete or ballast, while valuable timbers are found and employed in the construction of temporary bridges and other works.

There is no reason why the West African timbers should not be employed for sleepers, buildings, and bridges in West Africa as elsewhere, but the engineer cannot employ them upon a large scale until their identity and properties are known.

SIERRA LEONE GOVERNMENT RAILWAY.

A description of this railway accompanied by numerous lantern slides will be given by the Author, so that only a few brief particulars are required in this Paper.

The railway is of 2 ft. 6 in. gauge, with rails weighing 30 lbs. per yard and steel sleepers. The maximum gradient is 1 in 60 with a minimum curvature of 5 chains. The line has been built section by section and not as one undertaking.

The route of the railway is shown upon the maps on the wall ; leaving Freetown it passes through Hastings, Waterloo, Songo Town (32 miles), Rotifunk (55 miles), Mano, Mattru, Bo (135 miles) and reaches Baiima, 222 miles from Freetown. The section from Freetown to Songo Town includes 11 large viaducts. From Songo Town to Rotifunk there is one bridge of importance. The rest of the line consists of undulating country crossed by rivers of some size requiring several large bridges.

The following are the principal works upon the Sierra Leone Government Railway so far constructed :—

Works of interest	Mileage		No. of spans	Total length
	Miles	Chains		
Freetown to Songo Town :				Feet
Nichol Brook	0	78	9	281
Kissey „	4	75	6	280
Wellington Brook	7	40	7	312
Calaba „	7	77	5	158
Robiss „	8	16	4	162
Orogou Viaduct	11	65	6	386
Maroon „	12	78	7	330
Hastings „	13	50	7	294
Rokell „	16	15	3	94
Gaddon „	16	65	3	94
Lewis „	17	14	4	126
Allamangey Viaduct	18	24	5	182
Songo Town to Baiima :				
Ribbi Bridge	38	65	9	662
Bumpe „	55	40	2	63
Mongire „	61	60	2	63
Makora „	68	12	2	63
Yambutu Bridge	76	50	3	158
Bangue „	79	0	3	232
Taja „	106	43	10	589
Tabe „	118	40	4	233
Bebeye „	148	15	5	262
Sewa „	160	50	6	718
Male „	175	48	4	233

SIERRA LEONE MOUNTAIN RAILWAY.

Views will also be shown of this work, which was opened on March 1, 1904. This railway is of the same gauge as the main line of the Colony, but the gradient is as steep as 1 in 22, and the curvature through the streets of Freetown necessitates curves as sharp as 2 chains radius.

The railway is built for the purpose of affording communication between the Government buildings in Freetown at the foot of the hill and the new cantonment, consisting of residences for officials and others, situated on a plateau about eleven hundred feet above the sea, where the conditions of life will be far more healthy than in the town itself. It is hoped that the facilities afforded by this mountain railway will contribute largely to the improved health of the Colony, as the new cantonment will afford most extensive views both over the Atlantic Ocean and over the interior of the country for many miles, and will be fully exposed to the healthy sea breezes.

LAGOS GOVERNMENT RAILWAY.

Views of this railway will be shown, and a few particulars only need be included in the Paper.

The gauge of the Lagos Government Railway is 3 ft. 6 in., rails 50 lbs. per yard, gradients 1 in 50 with 10 chain curves. The line was constructed in sections and not as a whole.

The established communication between Lagos Island and the interior is now as follows: Leaving Lagos Town, with a population of some 42,000 people, one crosses the lagoon by the Carter Bridge 2,600 feet in length, and reaches the terminus of the railway, which is situated on the island of Iddo; thence the railway crosses the lagoon by the Denton Bridge 900 ft. in length, and reaches the mainland at Ebute Metta, where the workshops, quarters, engine-sheds, &c., are situated. It then runs up the fertile valley of the Ogun River, passing the village of Otta at 20 miles, and numerous other villages of varying importance till Aro is reached at 64 miles, whence a branch line, about $1\frac{3}{4}$ miles long, crosses the Ogun River and reaches Abeokuta.

Abeokuta ("the City under the Rock") is generally believed to have a population of nearly 100,000 people, and is enclosed by a wall about 15 to 20 miles in circumference. The branch line crosses the Ogun River by a bridge of three spans of 100 ft. and three spans of 60 ft. and a total length of 500 ft. The Main Line does not cross the Ogun River, but continues up its right bank and crosses at Lokomeji, finally reaching Ibadan 125 miles from Lagos, where the terminus at present remains.

Ibadan is a town of very considerable importance credited with a population of 180,000 people, with a considerable trade of its own.

The extension of the Lagos Railway beyond Ibadan is under consideration, and surveys have been made in anticipation of its eventual extension.

GOLD COAST (TARKWA) RAILWAY.

During a visit in 1896 of Sir William Maxwell, then Governor of the Gold Coast Colony, to the Tarkwa district, the practical impossibility of working the gold mines of the banket formation without railway communication with the coast was demonstrated.

A survey was made in 1897, with the result that the construction of a railway from Sekondi to Tarkwa was commenced early in 1898, but, owing to objections being raised with regard to the selection of Sekondi as a port, work had to be suspended until the Secretary of State for the Colonies, in July 1898, held a conference at the Colonial Office which resulted in the confirmation of the original route recommended. Work was recommenced in August 1898, but was much impeded by the scarcity of labour, the population of the locality being sparse and not taking to the new work.

The supply of labour remained for some time quite inadequate, but the Government of the Colony expressed a wish that labourers should not be imported, as they desired that the natives of the country should be given every opportunity of learning the work. Moreover, on account of the short length of the line to Tarkwa, it was impracticable to organise the importation of labour on a large scale.

The wet season of 1899 was abnormal, and very large quantities of rain fell, practically suspending the work, and many of the staff became sick, but in the dry season of 1899-1900 the work was again pushed forward as well as the inadequate supply of labour would allow.

At the beginning of 1900, in consequence of the possibility of the extension of the railway to Kumasi being undertaken, it became obvious that labour must be imported from other countries, and steps were taken to recruit it.

After a great deal of difficulty a supply of labour from Lagos was arranged for, but unfortunately the Ashanti war broke out in April 1900, putting a stop to all further importation of outside labour and taking away the natives already engaged upon the work to act as carriers for the troops.

The Ashanti war broke up the survey parties sent out to make a preliminary survey of the Kumasi Extension, frightened the labourers on the more advanced works, and generally caused serious disorganisation.

At the conclusion of the Ashanti war work was again pushed forward, and the railway reached Tarkwa in May 1901.

The actual period occupied in the construction was from July 1898 to May 1901, or thirty-four months, during which a base with landing-jetties, quarters, workshops, running-sheds, &c., was established at Sekondi, a place formerly consisting of a few mud huts and with no accommodation whatever. This work was carried out in the face of three wet seasons, a prolonged scarcity of labour, and eventually the last Ashanti war.

TARKWA-KUMASI EXTENSION.

In 1899 it was decided that an examination of the country between Tarkwa and Kumasi should be made with a view of deciding whether Kumasi should be approached by railway from Accra, as proposed by Sir William Maxwell, or by an extension of the Tarkwa Railway.

In 1899 a comparison of these two routes was made by the Author, and as a result of his report the Tarkwa-Kumasi Extension line, through unknown swampy and forest-clad country, was begun in June 1901, the rails reaching Obuassi December 20, 1902, and Kumasi in September last.

The time occupied in reaching Obuassi was 18 months in all, during which 86 miles of line, comprising very heavy clearing and earthworks, were constructed at an average rate of $4\frac{3}{4}$ miles per month.

NATURAL DIFFICULTIES OF CONSTRUCTION.

The difficulties encountered in constructing the West African Railways have been very numerous and peculiar to the country. They may be briefly stated under the following heads:—

(a) *Climate*.—The unhealthiness of the climate of West Africa is notorious and greatly interferes with continuity of organisation in carrying out extensive works. In order to provide against the disastrous effect of climate upon the railway officials, who are specially exposed to the weather, both heat and rain at all hours of the day, an eight months' service was in all cases instituted, carrying with it four months' absence on leave from the Colony on half-pay. Proposals have been made to extend the period of service, but this has so far been deemed inadvisable.

Elaborate medical arrangements have been organised upon each railway. At Sierra Leone there has always been a medical staff maintained by the Railway Department, the Colonial Hospital being

available. At Lagos the medical staff was very fully equipped. A small railway hospital was constructed, and the Colonial Hospital has been available as well. On the Gold Coast, owing to the complete isolation of the works, a large hospital has been erected at Sekondi, and another at Obuassi. The medical staff has always been kept at full strength, and fully equipped with all medical appliances, instruments, and medicines.

All the railway officials have been kept fully informed by pamphlets, books, &c., of the development of the Malaria Mosquito theory since it was first discovered, and detailed instructions as to site of camps, clothes to be worn, food and drink, have been issued to every employee.

In spite of these precautions the effect of the climate upon the staff is best shown by the changes that have occurred in the position of Chief Resident Engineer, Chief Accountant, and Chief Store-keeper at Lagos, and in the position of Chief Resident Engineer at Sierra Leone and Gold Coast, a list of which is given in full detail in the Appendix.

The detailed health statistics of each railway could be given in full, but the particulars of these five appointments are perhaps sufficient to emphasise the point.

It has been found that men of superior education occupying the higher appointments upon the railways keep their health better than those in the lower grades, hence some idea may be formed, from a perusal of these lists, of the great number of changes which have taken place amongst the entire staff of each railway.

The following table, showing the total numbers of European engineers and others employed on each railway, may be of interest :—

	Total Number of individual Europeans employed on each railway to end of 1903.	Total Number of Europeans sent to each railway, i.e., total number of "tours" of service to end of 1903	Remarks
Sierra Leone Government Railway	239	400	Still in progress
Lagos Government Railway . . .	219	333	Completed
Gold Coast Government Railway .	388	635	Completed

The effect of these constant changes upon the continuity of administration of each railway can be readily imagined, but this

cannot by any possibility be avoided in a climate such as that of West Africa.

(b) *The Wet Seasons*.—At the commencement of operations in West Africa it was expected that all active work would have to be suspended during the wet seasons, but this has not proved to be necessary. Surveys, indeed, have been completely stopped during the rains, but construction work has been carried on during the wet seasons, though of course always under great difficulties. The execution of an enormous quantity of earthwork upon the Gold Coast Railway during the wet season of 1902 was absolutely imperative in the case of a line telescopically constructed, but it is unsatisfactory from an engineering point of view.

As an illustration of the heavy rainfall in the West African Colonies, the actual fall for the year 1901 is given below, the greater part of this falling in the months of June, July, September, and October :—

Sierra Leone rainfall, 1901	175.43 in.
Lagos rainfall, 1901	112.59 in.
Gold Coast (Tarkwa) rainfall, 1901.	92.55 in.

In some cases tropical showers have fallen to the amount of 4 to 5 inches at a time, and upon the Gold Coast in June 1901 no less than 30 inches (2 ft. 6 in.) of rain fell in the month, an amount equal to the average total rainfall of the United Kingdom in one year.

(c) *Quality of Labour*.—In the case of each Colony the railway works have been carried on by means of West African native labour, the actual native of the district being employed, except upon the Gold Coast Railway, where natives of other parts were imported. The West African is unaccustomed to any but his own agricultural employment, and is naturally devoid of all skill and education, and possesses little energy. In course of time, however, the natives in each Colony have been educated by the Railway Department to take up the duties of station masters, porters, platelayers, mechanics, fitters, &c.; in Sierra Leone and Lagos with considerable success, the Mendis, Timinis, Egbas, and Yorubas having a certain amount of aptitude for the work. Upon the Gold Coast the Fantis and other tribes are somewhat more slow to develop the required talent.

(d) *Scarcity of Labour*.—In Sierra Leone and Lagos this did not occur except when the military operations took away the

railway labour as carriers for the troops, there having always been sufficient labour of a kind. This is due to the large populations in the neighbourhood of the railway. On the Gold Coast Railway, however, the scarcity of labour was a very serious matter, the supply falling at one time as low as about 600 men, a number perfectly inadequate for progress. The number of natives employed at various dates has been as follows :—

—	August 1899	June 1902	January 1903	January 1904
Sierra Leone Railway .	1,063	4,685	3,281	3,571
Lagos Railway . . .	10,426	Completed		
Gold Coast Railway . .	2,714	16,000	12,417	2,502
Total	14,203	20,685	15,698	6,073

(e) *Difficulties of Landing Cargo*.—Over-carriage of materials, damage to the same, and the wreck of ships carrying large consignments have added greatly to the difficulty of providing the materials in proper time and order, especially as it has only been possible to ship small quantities in each steamer in order not to congest the wharves and piers available.

At Sierra Leone the Wharf accommodation is extremely limited, though the landing facilities are otherwise good.

At Lagos it has been necessary to tranship all cargo at Forcados, some 150 miles beyond Lagos, into branch boats which can cross the Lagos Bar.

On the Gold Coast (Sekondi) all materials have had to be discharged into surf boats and lighters in the open roadstead. The lighterage is in charge of Messrs. Elder, Dempster & Co., and small consignments have been necessary to prevent delay to the steamers or congestion of the lighterage plant.

(f) *Scarcity of Ballast*.—This difficulty has perhaps been the greatest of all. At Sierra Leone ballast has been fairly plentiful, and the difficulty has not been formidable. At Lagos, however, there is a complete absence of hard stone of any kind for nearly 60 miles from the coast, and it was necessary to open the railway for this length very partially ballasted, and to allow the maintenance gangs to complete the work gradually. Upon the Gold Coast hard rock exists, but as a rule only at a depth of 50 to 100 feet from the

surface, and this has rendered the extraction of about 500,000 tons of stone required for the railway practically impossible from such quarries. It was necessary to adopt the expedient of searching for surface stones and boulders in the bush, and to bring them to the line to be broken up and distributed. This was a very laborious and costly work, but had to be carried out on account of the soft clayey nature of the soil on the Gold Coast which has rendered ballasting imperative.

EXTRAORDINARY INTERFERENCE WITH CONSTRUCTION.

Besides the natural difficulties which have been encountered as outlined above, the construction of railways in West Africa has been unfortunately interrupted by disturbances amongst the natives and military operations in the case of each Colony.

SIERRA LEONE.

In the case of the Sierra Leone Railway a native insurrection broke out in February 1898, and had the effect of stopping the works and disorganising the staff for some time. The rebels descended upon the railway and drove into Freetown the entire staff, and dissipated the whole of the native labour, causing a condition of panic, which continued for some time during which the railway and its plant were left at the mercy of the rebels. During the whole of 1898 and until April 1899 the requirements of the native troops sent up country to quell the disturbance, and of the troops sent to the Colony as a punitive expedition, took away a very large number of the labourers engaged upon the railway to act as carriers to these expeditions. The result of this disturbance was to detain the rail-head at Songo Town, the end of the first section, although authority had been received for the next section to Rotifunk. Upon the termination of this disturbance in April 1899 the Songo Town to Rotifunk section was completed in about eight months.

LAGOS.

At Lagos the disturbance was not due to the natives, but at the latter end of 1897 and the early part of 1898 the operations of the French in the Hinterland required the urgent despatch of troops up

country, and for this purpose almost all of the railway labourers, and some of its officers, were taken by the Government to act as carriers to the military expeditions. At the conclusion of the military operations work was recommenced in October 1898, and the rails advanced from 30 miles to 64 miles (Abeokuta) in seven months, or at the rate of 5 miles per month, and from Abeokuta to Ibadan, at 125 miles, in twenty months more.

GOLD COAST.

On the Gold Coast the special disturbance was the Ashanti War, which broke out in April 1900, and continued until the end of that year. The effect on the labour has been referred to above, and may be briefly described as putting an end to the importation of labour into the Colony from other parts of West Africa, which after a great deal of trouble had been eventually organised. At the conclusion of the Ashanti War, rail-head advanced from 25 miles to 126 miles in twenty-two months, equal to a rate of $4\frac{1}{2}$ miles per month.

RATE OF CONSTRUCTION.

The rate at which the West African Railways have been constructed will be shown graphically by a lantern slide, and compared with that of French and Belgian railways in West Africa.

It must be remembered that these railways have not been constructed as a whole, but tentatively, section by section, an interval frequently occurring between the completion of one section and the authorisation of the next, and in all cases the authorisation of the work by sections has prevented an organisation suitable for the rapid construction of the whole. This cautious policy has no doubt been the best for each Colony to adopt, but has naturally tended to some extent to prevent the increasing rate of progress which would have been realised if from 120 to 220 miles of railway had been undertaken at a time.

The rate of construction of railways in West Africa is hindered by want of landing facilities, sickness of staff, the absence of continuity of administration due to climate, excessive rainfall, and the physical obstruction of the dense tropical forest, rendering survey very slow and requiring heavy labour in clearing, and by the necessity for carrying on the entire work and conveying all the materials from one base.

The following table sets out the rate of progress of each railway :—

Section	Length Miles	Begun	Finished	Time in Months	Average Rate in Miles per Month
Sierra Leone Railway (2 ft. 6 in. gauge):					
Freetown — Songo Town ¹ . . .	32	Mar. 1896	Dec. 1898	33	1
Songo Town—Roti- funk ² . . .	23	June 1899	Mar. 1900	9	2.6
Rotifunk—Bo ² . .	80	Dec. 1900	Oct. 1902	22	3.6
Bo — Baiima ³ . .	87	Jan. 1903	Nov. 1904 (expected)	22 (expected)	3.9 (expected)
Total. . .	222			86	2.7 average
Lagos Railway (3 ft. 6 in. gauge):					
Lagos—Otta ⁴ . .	20	Mar. 1896	Sept. 1897	18	1.1
Otta—Abeokuta ⁵ .	44	Oct. 1897	April 1899	18	2.5
Abeokuta—Ibadan ⁶ .	61	May 1899	Dec. 1900	19	3.2
Total. . .	125			55	2.3 average
Gold Coast Railway (3 ft. 6 in. gauge):					
Sekondi—Tarkwa ⁷ .	40	Aug. 1898	May 1901	33	1.2
Tarkwa—Obuassi ⁸ .	86	July 1901	Dec. 1902	17	5
Obuassi—Kumasi . .	44	Feb. 1903	Sept. 1903	7	6.3
Total. . .	170			57	3.0 average

¹ Includes construction of headquarters. Difficult country, eleven steel viaducts. Interrupted by native insurrection.

² Interrupted by native insurrection.

³ In progress.

⁴ Includes construction of headquarters and bridge to mainland.

⁵ Delayed by military operations.

⁶ Includes terminal work at Ibadan.

⁷ Includes construction of headquarters and pier. Delayed by scarcity of labour and Ashanti War. Heavy rains.

⁸ Rail laying reached twelve miles per month. All traffic offered carried upon railway.

The progress of the British West African Railways can be

favourably compared with the railways made in Tropical Africa by other Powers, as shown in the following table :—

RATE OF PROGRESS OF CONSTRUCTION OF RAILWAYS IN TROPICAL AFRICA
BY OTHER POWERS.

Railway	Gauge	Length Miles	Begun	Finished	Time in Years	Average Rate
FRANCE :						
French Senegal : Kayes — Niger Railway	Metre	348, of which 250 are completed	1881	Still in progress	23	11 miles per ann.
French Guinea : Konakry-Niger Railway ¹	Metre	342, of which 46 miles are com- pleted	June 1900	Still in pro- gress. Reached 46 miles June 1903	3	15 miles per ann.
Dahomey Rail- way ²	Metre	About 500 miles pro- posed, of which 55 miles are completed	May 1900	In progress	3½	16 miles per ann.
Ivory Coast	The	proposed rail	way	has not yet	been	started
GERMANY :						
Kamerouns	The	proposed rail	way	has not yet	been	started
CONGO FREE STATE :						
Congo Railway ³ .	2' 6"	250	1889	1898	9	28 miles per ann.
EAST AFRICA :						
Uganda Railway ⁴	Metre	584	early 1896	Temporary line, early 1902	6	97 miles per ann.
				Permanent line com- pleted, say, middle of 1903	7½	78 miles per ann.
Beira Railway	2' 0" altered to 3' 6"	187	1892	1898	6	31 miles per ann. (2-6 miles per month)

¹ This line is open to 46 miles, and work is proceeding further ahead.

² Easy country, but Lama swamp at 55 miles has caused delay. Concessionaire provides materials only, and receives a subsidy of £80 per kilo, and a land grant of 1,150 square miles.

³ Fairly open country; imported labour; 2 ft. 6 in. gauge.

⁴ Much open country; comparatively healthy.

It will be seen from the above table that the rate of construction of the British West African Railways compares not unfavourably with other railways in Tropical Africa, with the exception of the Uganda Railway, which was authorised and organised as a whole and not by tentative sections.

COST OF CONSTRUCTION.

In considering the cost of the construction of railways in West Africa due allowance must be made for the fact that they have been constructed through dense tropical forest in what is generally recognised as the worst climate in the world, necessitating very short terms of service, constant changes of staff in every grade, very heavy rainfall, scarcity and inferiority of unskilled labour, and the complete absence of skilled labour; landing difficulties, and the necessity of carrying on construction entirely from one base. Further allowance must be made for the native revolts and military operations which have occurred in each case.

Cost of the West African Railways,

Including Permanent Bridges, Headquarters Establishment, and Rolling Stock, &c., complete.

—	Gauge	Total Cost	Length Miles	Cost per Mile
		£		£
Sierra Leone :				
1st section ¹ . . .	2 ft. 6 in.	193,946	32	6,060
2nd section ² . . .	2 ft. 6 in.	97,164	23	4,224
3rd section ³ . . .	2 ft. 6 in.	319,046	80	3,988
4th section ⁴ . . .	2 ft. 6 in.	348,000	87	4,000
Total and average .		958,156	222	4,300

¹ Includes establishment at base and eleven steel viaducts.

² Impeded by native revolt.

³ Including permanent steel bridges.

⁴ Estimate.

Gold Coast ¹ . . .	3 ft. 6 in.	1,753,488	170	10,300
Lagos ²	3 ft. 6 in.	882,961	125	7,064

¹ Dense bush, scarcity of ballast, Ashanti War, much ill-health, nearly all labour imported.

² Cost of main line to June 30, 1903.

Cost of other African Railways.

—	Gauge	Total Cost	Length Miles	Cost per Mile
		£		£
Tropical African:				
*Uganda Railway ¹ . .	Metre	5,550,000	584	9,503
†Congo Railway ² . .	2 ft. 6 in.	2,600,000	250	10,400
Temperate African:				
‡Cape of Good Hope Government Railway ³ .	3 ft. 6 in.	21,842,216	2,089	10,456

¹ Still incomplete. ² Narrow gauge. Severe gradients. Open country.

³ To December 31, 1900.

Cost of other Colonial Railways.

‡New South Wales Government Railway ¹ .	4 ft. 8½ in.	38,932,781	2,845	13,684
‡Tasmanian Government Railway ²	3 ft. 6 in.	3,659,069	439	8,335
‡Queensland Government Railway ³	3 ft. 6 in.	19,526,370	2,801	6,971
‡New Zealand Government Railway ⁴ . . .	3 ft. 6 in.	17,207,328	2,212	7,779

¹ To June 30, 1901.

² To December 31, 1900.

³ To December 31, 1900.

⁴ To March 31, 1901.

Cost of some Indian Railways of Equivalent Gauge.

—		R.		R.
§Rajputana—Malwa . .	Metre	12,87,20,729	1,674	76,894
§Southern Mahratta . .	Metre	9,51,13,422	1,042	91,279
§South Indian	Metre	7,42,48,486	1,042	71,255
§Burma	Metre	7,56,31,200	886	85,362

* From statement in Parliament, December 1902.

† From Annales des Travaux Publics de Belgique.

‡ From Statistical Table *re* Colonial Possessions of the United Kingdom, 1900.

§ From Administration Reports on Railways in India.

There is one important point to be noticed with regard to the speed of construction and the cost of railways in West Africa—that the further they are constructed the greater is the speed of construction and the less the cost, provided they are authorised and organised as a whole and not in sections. This is due to the better climate and the more open country found further inland, the greater facilities given to the staff to organise the machinery of construction, the increasing confidence and efficiency of the native labourers, and the existence of an established base with quarters for the staff, workshops, and improved landing facilities.

SUMMARY OF PRESENT DEVELOPMENT BY RAILWAYS.

To summarise what has been already accomplished in the development of West Africa by railway construction by Great Britain and other Powers it may be stated:—

That in Sierra Leone a railway 222 miles long has been nearly completed traversing the Colony from West to East, forming one of the longest continuous lengths of railway of 2 ft. 6 in. gauge in the world, and being the most cheaply constructed line on the Western side of Africa.

In Lagos a 3 ft. 6 in. gauge line, 125 miles long, has connected up the three largest towns on the West Coast of Africa—Lagos, Abeokuta and Ibadan.

On the Gold Coast a 3 ft. 6 in. line, 170 miles long, has placed Kumasi, the capital of Ashanti, within sixteen days' journey of Great Britain.

The French have connected St. Louis and Dakkar by rail, and are proceeding with metre-gauge railways connecting Kayes and Koulikoro in Senegal, Konakry and Kouroussa in French Guinea, and Kotonou and Paouignan in Dahomey.

The Belgians have connected Matadi and Leopoldville with a 2 ft. 6 in. gauge line, and are proceeding with extensions.

FUTURE DEVELOPMENT BY RAILWAYS.

With regard to the future development of West Africa by railway construction, the field is a very large one. The immense area of Western Africa would not be adequately served by one hundred times the length of railway at present constructed. All railways, however, in West Africa, with few exceptions, must at present be developmental, and must be constructed without immediate prospect of a return upon the cost of construction, since it will take time to educate the natives and develop trade to such an extent as to return interest on the capital expended.

Under these circumstances private enterprise cannot be expected to assist in constructing railways, and the duty devolves upon the Governments of the Colonies to proceed with construction as and when they see their way to do so, care being taken that each advance made shall be part of a well-considered general scheme, and that no one Colony shall be tempted by temporary exigencies to construct a line that cannot be hereafter absorbed into the general system.

Uniformity of gauge is the most elementary condition to be fulfilled, at any rate where there is a possibility of future connections, and the principle of standardisation of works of art and rolling stock within certain types should be judiciously applied.

Such carefully considered construction can be proceeded with as the resources of the Colonies permit; but when the Colonies are unable to undertake further responsibilities, the question arises as to whether the Imperial Government should not assist the Colonies by grants of money for the construction of the most urgent railways.

At the present time circumstances are perhaps unfavourable for such action, but in due time no doubt the public at home may realise the value of these West African Colonies, and be ready to subscribe to loans guaranteed by the revenues of the Colonies, or to concur in a substantial grant for developmental railways.

France has been already able to do this, and has granted a sum of 65,000,000 fr. (£2,600,000) for the completion of the Senegal line, the continuation of the Guinea and Dahomey lines, and the commencement of the Ivory Coast Railway.

The French schemes for railways in West Africa—now in process of conversion, partially at any rate, into accomplished facts—entirely dwarf the British constructed railways.

France is now pushing forward no less than four lines of railway with increased speed, while the British railways are drawing near completion. For instance, the Dahomey railway is being vigorously pushed forward by the French, while the adjoining Lagos railway has remained stationary for the last three years.

At the moment it is important that the Sierra Leone Railway should serve to increase the trade of the Colony, but in this the co-operation of enterprising merchants is required; and that the Gold Coast Railway should assist the gold mines to become dividend-payers, and in this the assistance is required of the capitalist who eagerly subscribed money during a premature gold boom, but now, perhaps "once bitten twice shy," fails to see the opportunity for successful investment now that the railway makes mining possible. The Colony of Lagos requires the assistance of the Imperial Government to push its railway northwards to Zaria and Kano, making a trunk line of railway in a fairly central position in the Lagos-Nigeria territory, establishing military control of the whole area and developing its trade, piercing further inland than any of the French West African projects, and preventing the absorption of the trade of Nigeria by the French Colonies.

Possibly the early adoption of some half-measure, such as Sir Frederick Lugard's proposal of a line from Baro on the navigable Niger to Zaria and Kano, might assist the general scheme, but every advantage should be taken of the time elapsing before money for any such scheme becomes available to continue the study of this scheme in all its bearings, so that when construction is commenced it may be upon such a route, of such a gauge, and of such a type as may be found to be most suitable in the interests of the Protectorate.

The lantern slides shown during the evening are from the Author's photographs, supplemented by private photographs kindly lent by Messrs. H. Adcock, T. J. Alldridge, G. H. Fleming and T. G. Maidment, and by an unique set of views of Cotton Cultivation in the Sierra Leone Protectorate, by Mr. L. C. Boyle, and by views of the Lagos Railway, specially taken by Mr. F. Bedford Glasier, the General Manager.

APPENDIX

LAGOS GOVERNMENT RAILWAY.

Changes in the Position of Chief Resident Engineer.

Individual	Date		Reason for Leaving Office
	Taking Office	Leaving Office	
No. 1 .	Nov. 17, 1895	July 7, 1896	Resigned on account of ill-health
No. 2 .	July 7, 1895	Sept. 21, 1896	Acting appointment only, relieved by new Chief
No. 3 .	Sept. 21, 1896	May 23, 1897	On leave
No. 2 .	May 23, 1897	July 29, 1897	Invalided
No. 4 .	July 29, 1897	Sept. 23, 1897	Died
No. 3 .	Sept. 23, 1897	May 22, 1898	Invalided at home
No. 5 .	May 22, 1898	June 24, 1898	Died
No. 6 .	June 24, 1898	Aug. 7, 1898	On leave
No. 7 .	Aug. 7, 1898	May 16, 1899	On leave
No. 6 .	May 16, 1899	Nov. 7, 1899	On leave
No. 7 .	Nov. 7, 1899	Feb. 8, 1900	Died
No. 8 .	Feb. 8, 1900	May 7, 1900	On leave
No. 6 .	May 7, 1900	Mar. 12, 1901	Transferred to Gold Coast
No. 9 .	Mar. 12, 1901	July 5, 1901	On leave
No. 10 .	July 5, 1901	Nov. 4, 1901	On leave
No. 11 .	Nov. 4, 1901	Jan. 31, 1902	Line handed over to the Open Lines Department

Changes in the Position of Chief Accountant.

Individual	Date		Reason for Leaving Office
	Taking Office	Leaving Office	
No. 1 .	Jan. 1, 1896	Mar. 30, 1896	Died
No. 2 .	April 4, 1896	Mar. 18, 1897	On leave
No. 3 .	Mar. 18, 1897	Aug. 27, 1897	Acting appointment only, relieved by new Chief
No. 2 .	Aug. 27, 1897	Nov. 2, 1897	Died
No. 4 .	Nov. 2, 1897	Mar. 31, 1901	Transferred to Open Lines
No. 3 .	Mar. 31, 1901	June 5, 1901	Transferred to Gold Coast
No. 5 .	June 5, 1901	Jan. 31, 1902	Construction Dept. closed

Changes in the Position of Chief Storekeeper.

No. 1 .	Sept. 23, 1896	May 23, 1897	On leave
No. 2 .	May 23, 1897	Sept. 23, 1897	Acting appointment only, relieved by new Chief
No. 1 .	Sept. 23, 1897	Dec. 17, 1897	Invalided
No. 3 .	Dec. 17, 1897	May 22, 1898	On leave
No. 4 .	May 22, 1898	Oct. 3, 1898	On leave
No. 3 .	Oct. 3, 1898	May 31, 1899	Dismissed
No. 4 .	May 31, 1899	Aug. 20, 1899	On leave
No. 5 .	Aug. 20, 1899	Feb. 22, 1900	Died
No. 6 .	Feb. 22, 1900	April 22, 1900	Acting appointment only, relieved by new Chief
No. 4 .	April 22, 1900	Jan. 1, 1901	Transferred to Gold Coast
No. 7 .	Jan. 1, 1901	Feb. 1, 1901	On leave
No. 8 .	Feb. 1, 1901	May 18, 1901	Acting appointment only, relieved by new Chief
No. 6 .	May 18, 1901	Oct. 14, 1901	Transferred to Open Lines

SIERRA LEONE GOVERNMENT RAILWAY.

Changes in the Position of Chief Resident Engineer.

No. 1 .	Nov. 16, 1895	July 7, 1896	On leave
No. 2 .	July 7, 1896	Nov. 7, 1896	Acting appointment only, relieved by Chief
No. 1 .	Nov. 7, 1896	July 23, 1897	On leave
No. 3 .	July 23, 1897	Nov. 26, 1897	Acting appointment only, relieved by Chief
No. 1 .	Nov. 26, 1897	Sept. 25, 1898	On leave
No. 3 .	Sept. 25, 1898	Mar. 5, 1899	Acting appointment only, relieved by Chief
No. 1 .	Mar. 5, 1899	Mar. 3, 1900	Transferred to Gold Coast
No. 3 .	Mar. 3, 1900	July 21, 1900	On leave
No. 4 .	July 21, 1900	Jan. 21, 1901	On leave
No. 5 .	Jan. 21, 1901	Feb. 19, 1901	Acting appointment only, relieved by new Chief
No. 3 .	Feb. 19, 1901	May 9, 1901	Invalided
No. 6 .	May 9, 1901	Sept. 26, 1901	Acting appointment only, relieved by new Chief

Changes in the Position of Chief Resident Engineer.—cont.

Individual	Date		Reason for Leaving Office
	Taking Office	Leaving Office	
No. 2 .	Sept. 26, 1901	May 26, 1902	On leave
No. 6 .	May 26, 1902	Oct. 2, 1902	Acting appointment only, relieved by Chief
No. 2 .	Oct. 2, 1902	May, 1903	On leave
No. 6 .	May, 1903	Oct., 1903	Acting appointment only, relieved by Chief
No. 2 .	Oct., 1903		Still in Colony

GOLD COAST GOVERNMENT RAILWAY.

Changes in the Position of Chief Resident Engineer.

No. 1 .	Feb. 9, 1898	May 24, 1898	Special leave to attend conference <i>re</i> route
No. 2 .	May 24, 1898	Aug. 26, 1898	Acting appointment only, relieved by Chief
No. 1 .	Aug. 26, 1898	May 18, 1899	On leave
No. 2 .	May 18, 1899	Oct. 6, 1899	Acting appointment only, relieved by Chief
No. 1 .	Oct. 6, 1899	June 5, 1900	Resigned
No. 3 .	June 5, 1900	Nov. 17, 1900	Acting appointment only, relieved by new Chief
No. 4 .	Nov. 17, 1900	July 15, 1901	Resigned
No. 3 .	July 15, 1901	Sept. 6, 1901	Acting appointment only, relieved by new Chief
No. 5 .	Sept. 6, 1901	May 8, 1902	On leave
No. 6 .	May 8, 1902	Sept. 22, 1902	Acting appointment only, relieved by Chief
No. 5 .	Sept. 22, 1902	July, 1903	On leave
No. 6 .	July, 1903	Oct., 1903	Acting appointment only, relieved by Chief
No. 5 .	Oct., 1903	Mar., 1904	Line handed over to Open Lines Department

DISCUSSION.

The CHAIRMAN (His Grace the Duke of Marlborough, K.G.): I feel sure you will allow me to express on your behalf the great interest and pleasure Mr. Shelford has afforded us, both by his lecture and by the admirable illustrations he has put upon the screen. Our minds have been so much occupied with South Africa and the great problems involved in that part of the world that for the moment, perhaps, our attention has been diverted from the importance of our West African possessions. I believe, a belief

which is rather the result of conversation with those who are acquainted with West Africa, that the possibilities of our protectorates there, and of developing them in the future, are enormous, and that we may look forward to an increasing trade between them and the Mother Country, a trade which will be most profitable to ourselves and advantageous to the inhabitants of those territories. Mr. Shelford pointed out in the early part of his lecture that the fact of these railways having been built will help us to get troops more swiftly into the districts traversed, and so enable us to put down any risings which might occur. Well, they could, no doubt, be employed for that purpose, but I think they have an even more valuable purpose to serve. For the mere fact of our having constructed these railways ensures, to a certain extent, the civilisation of the natives themselves, who will be brought into closer contact with the representatives of this country, and from their relations with Englishmen whom they meet will gain confidence in our rule and learn to recognise the justice and proper treatment which we mete out to those under us. I think these influences, of themselves, will be a far greater security that in future we shall have no rising or other difficulties in connection with the natives than the mere fact that we are able to get our troops about more expeditiously. It is curious to think, after looking at the slides showing the admirable work that has been done in West Africa, that ten years ago not ten yards of railway had been laid. The whole of this construction has been carried out during the last ten years, and I think I am right in saying that an average of about fifty miles of railway has been laid every year since then—that is to say, about five hundred miles in all. Thus we have been able to construct a railway, say, from here as far as Oxford every year during the last ten years. I certainly think that reflects some credit on the energy and enterprise of the late Secretary of State for the Colonies and of those associated with him during the years he was at the Colonial Office. On this point I will say further that I have no doubt that, although the inspiration and the initiative came from him, it would have been impossible to make these railways so successfully had it not been for the hearty co-operation and the skill and science of those great firms on whose technical knowledge we are, to so large an extent, obliged to rely. Mr. Shelford touched on the cost of these railways. I dare say some of you may think that they cost a considerable amount of money. I am not really qualified to express an opinion on that point; but I was very much interested in the admirable analysis Mr. Shelford gave, not

only of the cost of these railways as compared with those of other countries, but also of the comparative rate of construction. I think we may fairly claim that we have not been behind other countries in the rate of construction, and that our own railways have not exceeded in cost those of our colonial competitors. The average rate of construction per month is, I think, a very fair average, considering the enormous difficulties that have to be encountered, the great jungles which have to be cut through, and the primitive methods which have to be employed to overcome various engineering difficulties. We have heard much about the Uganda Railway, and there are those who consider that its construction was very expensive, but the Congo Railway (which, I presume, was built by the King of the Belgians and has a narrower gauge) cost over £10,000 a mile, whereas the Uganda Railway cost about £9,500 a mile. I think, then, we may claim that the cost of our railways, although no doubt considerable, is certainly less than the cost to other countries who are trying to carry out the same pioneer work as ourselves. Mr. Shelford touched upon the importance of Nigeria and the possibilities of railway construction in that territory. Speaking not only for myself, but for those with whom I am connected, from the Secretary of State downwards at the Colonial Office, I am sure we all hope that in the future that work of railway construction which has been so successful in West Africa may be continued in a yet greater extension in Lagos, Southern Nigeria, and Northern Nigeria. It is obvious, of course, that in these matters we cannot move very swiftly. I confess, when I ponder over them, I feel that the life of a man should be at least 100 years, and that in the short space of time Under Secretaries are allowed and permitted to remain in different Government departments we cannot hope to see carried out all those great schemes which we are so anxious to see completed in the future. We must have patience, and look forward with hope that between now and some years to come sufficient funds may be forthcoming to develop a real railway system from the sea coast up into the heart and centre of Nigeria to Zaria or Kano, which will enable us to open up the country and at the same time develop the great cotton industry, which will not only be a benefit to the Colony itself but help to supply the deficiency of cotton now existing in the Lancashire market. But when these schemes will be put into practical effect it is difficult to say. I only hope that, whoever may be responsible for constructing these railways, they will bear in mind the admirable help and scientific knowledge which has been so willingly and freely given to the

Colonial Office by firms like Messrs. Shelford & Son in years gone by.

Sir WILLIAM MACGREGOR, K.C.M.G., C.B.: It is not to be expected, as you will have gathered from the lecture, that everyone will agree with Mr. Shelford in all his opinions, but we shall all agree that he has done well to bring before us in the way he has done this very interesting and important question. It is a subject on which a great deal might be said, but I shall confine my remarks to a few points which have occurred to me during the reading of the Paper. First of all as to the way we built these railways in West Africa. Mr. Shelford has put before you the various uses to which they are put. I am glad he has drawn attention to the important point that in the Colony which I have the honour to govern at the present time the railway is not required for the purpose of putting down disturbances. We have no internal war in Lagos. But if we have no war, we have a population which is very intent on agricultural and economical development. It is for that reason we require our railways and a further extension in the Colony. You will see from the map that a lagoon extends from Lagos towards the east which is navigable for small craft up to the boundary of Southern Nigeria. It extends in the other direction as far as Dahomey. That also is capable of being navigated by vessels of small draft. But for carrying trade and commerce inland we have only the railway from Lagos to Ibadan. The best land for the cultivation of cotton lies beyond the present railway. It therefore becomes for us a matter of great importance that the railway should be extended. Mr. Shelford has referred to the population of these districts. If I differ from him at all, it is that I on the whole, perhaps, entertain a higher opinion than he does of the enterprise and energy of the Yorubas. They are more energetic and enterprising than Mr. Shelford thinks, and if he had been as much among them as I have I am sure he would entertain as high an opinion of their capabilities as I do. But there is another reason for building railways in our Lagos territory. He has pointed out what our neighbours are doing—they are building railways as fast as they can. Can we afford to be behind them? I think not; for, if we are, we shall undoubtedly lose our trade and commerce. As far as I as a layman am able to judge, the railway from Lagos to Ibadan is quite sufficiently substantial to serve as a trunk line, to be extended to Kano if you like. That is a very important point. There is one question which has been much debated of late in this country; I mean the method of construction

I see no reason why that question should not be looked fairly in the face. I have a clear and decided opinion myself that the extension of our railway from Ibadan would be much better carried out under the present departmental system than under any other plan. What is the position of a consulting engineer? He has accumulated a valuable amount of experience; he has learnt how to cope with the difficulties which present themselves—difficulties due to weather, physical obstacles, and the like—and is therefore quite at home in dealing with the whole subject; but would that be the position of any contractor? Certainly not. But since these railways were undertaken there comes in another question—the sanitary question. It is clear that the engineer and the doctor ought to run in double harness, so to say, in that part of the world. In no matter is that more important than in the building of railways. I should dread the construction of railways by a contractor in Lagos. His object would be simply to build his railway irrespective of sanitary considerations at the least cost to himself, with the result that he would leave lines of great pits, and each pit would be bound to become a centre for the propagation of malarial fever. It is most essential, I think, that sanitation should be kept in view from the commencement of the building of the railway until the end. I therefore hope the departmental system will be adhered to, for in that way we shall have all the advantage of the experience already gained and avoid prejudicing our future. When our railway is completed, including not only construction but rolling-stock, approaches, &c., the Colony will have to find about £1,300,000. That is a large sum of money, and the question is, Is that quite prudent? It is to be advanced partly by the Imperial Government, and partly by the Crown Agents. As regards the latter, I wish to say this. I first became the Treasurer of a Colony in 1877, and from that time to now I have seen a good deal of the financial transactions of the Crown Agents, and I wish to say frankly and openly I have been very much struck with the excellent way in which they have always been able to obtain money to advance to any of the Crown Colonies. How it is done I have never been quite able to understand, but I am clearly of opinion that they confer on the Colonies great advantages in the way they are able to advance money to them on favourable terms. Will all this pay? At the present time the Lagos line pays working expenses and something more. It has come up to all I looked for during the first few years of its existence. If the railway is extended so as to open up the best parts of the cotton country, and so as to give

us a greater length of line, with almost the same stock as at present, I have no doubt the Lagos line will pay working expenses and also, I believe, interest on capital. If so, then I say the policy of the extension of railways is not only the right one, but one which ought to be pushed on with vigour.

Sir ALFRED JONES, K.C.M.G. : I think anyone who knows our trade and the position of things in West Africa must be more than ever convinced we are a nation of grumblers. I grumbled for more than twenty years because we could not get railways made, and I think I should have been grumbling now if we had not had Mr. Chamberlain at the Colonial Office. Now that they are constructed, there are those who grumble at the cost. I think the railways have been very well made, in the face of great difficulties, and for my own part I think, whatever the cost, Africa should have these railways in the interest of both Africa and of this country. I was very much pleased to hear the speech of Sir William MacGregor; no one has done more for Africa than he has done. I speak as President of the Liverpool Tropical School, and there is no doubt that that school and the London School have done much for the health not only of the British people there but of the natives; and on that point I would say that the British people can never do any good in Africa unless they make the position of the native prosperous. I tried to push the Government into the making of these railways. If I had the thing to do over again I do not think I could have made them better than they have been made. We never should have had these railways but for the active co-operation of the Crown Agents and Sir Montagu Ommanney. As to cotton-growing, I consider we ought to have begun this twenty years ago. Africa possesses enormous possibilities, but you cannot have cotton and you cannot have Lancashire secured in this respect unless you have some means of carrying the cotton from the interior. There is abundance of labour at 6*d.* a day, while in America you have to pay 4*s.* The best missionary you can send to Africa is "the Iron Horse," which will make the country. If the British people have not got the money they can borrow. Make the railways: don't stand still. The French are going ahead and you cannot afford to stand still. In ten years you might have cotton from Africa which would supply not only what Lancashire wants but what America wants, because the supply is cheaper from Africa than what you can get in America. I think a great deal of credit is due to Mr. Shelford. We ought to be thankful for what we have got, and try to get as much more as we can.

Capt. C. H. ELGEE : It has been a great privilege to listen to the admirable Paper we have just heard read by Mr. Shelford—the more interesting to me inasmuch as I have watched the Lagos line in its course of construction for the past five years, living amongst the workers and noting their methods of procedure. One fact with which I am sure all will be in concordance is, that for the prosperous development of such territories as we possess in West Africa railways are far and above the best expanders, civilisators, developers, and, to use photographic parlance, “fixers,” that it is possible at the present moment to devise. They are better, less costly in the long run, and more permanent in every way than military expeditions with the Maxim gun. This granted, there remains the question of the expense both in money and life of the present system of railway construction. Can either be lessened? I say most emphatically yes they can. To compare the cost of our railways with those of the French, or the cost of this line with that, is, to my mind, practically useless, for each line of construction has its own separate problems peculiar to itself and influenced to a large extent by the cost of labour and land, tunnelling and bridging. Eliminate these varying factors, and there remain the two common ones, common to all lines—viz. the cost of labour and life in their construction. If these bills could in any way be diminished, we should surely be stepping in the right direction. I hope to show you that they can. Of the urgent necessity of a continuation of our railway policy in West Africa from a national point of view there can be no doubt. But unfortunately railways cost money, and with the market upset as it was by the South African war it is not perhaps the happiest time at present to expect Imperial loans in this connection. If the war above referred to had not taken place there can be no doubt but that the Government would have been able to do far more in this direction than they have been. It is, however, no use crying over spilt milk, and these considerations of the “lack of the needful” make it the more imperative for us to cut down the expense of construction if possible. To effect this, what I propose is as follows ; and that the idea will present certain difficulties at first sight I am not vain enough to disbelieve. I would have the Colonies by themselves, with their own *personnel*, play a larger part than heretofore in the rough work of construction. The final survey of the proposed extension being completed, I would hand over to the Public Works Department of the Colony the work of preparing the rough way. The staff of this department might have to be increased for the purpose ; but in this, as in the method of

carrying out the work, the Governor of the Colony, and through him the Director of Public Works, would be given a free hand. The work in the rough, and of course minus bridges and other permanent structures, being completed, the expert staff would be called in to lay the rails and complete the line. I am convinced a great saving could be effected in this way. At present, construction staffs come out in their expensive numbers. They are new to the country and to the local conditions, and doubtless much money and health is lost before they become settled down. For the same reason—and this is my second proposition—I would have the entire medical supervision of all railway hands under the Government medical officers of the Colony. Mr. Shelford refers to West Africa as being admittedly the most unhealthy of places. I doubt if this will be repeated fifty years hence. Enormous changes are taking place in this direction now at the present time, and certainly, if I were a labourer, I would unhesitatingly prefer to work for eight months in the plains of West Africa rather than, for instance, those of India. The nature of railway work, which necessitates the upturning of so much soil, predisposes the officials engaged to ill-health, and this renders it doubly necessary that they should have at hand doctors thoroughly versed in local lore to attend them when stricken. The necessity so ably pointed out by Mr. Shelford of constructing all our lines which have any future chance of joining each other on the same system is too obviously clear to need comment. For instance, it would, in my humble opinion, appear the reverse of wise if Northern Nigeria were to construct a line upon any but the 3 ft. 6 in. gauge of Lagos, for that the two must one day join can scarcely be questioned. I must thank the Council of the Institute for permitting me to speak on such an extremely interesting and important subject.

Mr. T. J. ALLDRIDGE (District Commissioner, Sherbro): It is somewhat difficult to realise that the magnificent views at which we have been looking represent scenes in territories which do not enjoy the highest reputation for civilisation and for salubrity. There can be no doubt that the want of overland transport has been the means of retarding civilisation and keeping back the development of the enormous natural resources which West Africa possesses. For my own part, I propose to speak only a few words on the Colony of Sierra Leone, and more particularly on the district with which I am associated, Sherbro. The transformation which has taken place in Sierra Leone since the introduction of railways by the Government is remarkable, and to persons like myself, who have

frequently in earlier days had to go over land by hammock which is now traversed by railways, the change seems incredible. It must be patent that, although there may be vast natural resources within a district, those resources are absolutely wasted unless the natives have the means of transporting their commodities down to the coast line. You will observe that the railway at present runs as far as Bo, but there is an extension which is to carry the railway to Baiima. I am able to speak with some sort of authority because I have had some thirty-three years' experience of West Africa. Now, the country that that railway is traversing at present is one of the richest in the Colony. After the railway has got to Baiima it will be necessary, I think, that it should be brought down in a southern direction to those districts which are undoubtedly amongst the richest in indigenous productiveness within that sphere of influence, the Gaura-Tunkia and Barri countries. The map you see on the walls is dotted about with palm trees. The exports from Sherbro last year of palm kernels amounted to 14,000 tons. They are got from under the fronds of the oil palms and grow in large bunches. After they are pulled down the palm oil is expressed through the outer covering of the nut. It takes four tons of palm nuts to make one of palm kernel ; it follows that the 14,000 tons these natives crack represent no less than 56,000 tons of palm nuts which have to be dealt with in that way. Yet we hear people at home say that the people are a lazy set. One of the greatest object-lessons for these people has been the railway going through the country without any visible means of propulsion. It must be evident that the time is near at hand when steam or other power must be introduced into the district, and then we shall be able to set free an enormous amount of labour now wasted over the cracking of these palm nuts, and which labour will be used in some other industries, as, for instance, the growing of cotton. We want this cotton grown. I was in Lancashire a few days ago and learned the distress there was appalling. I was taken over one of the mills and was told that the week before they had worked only twelve hours. Unless we can produce cotton in our Colonies I do not know what state of things will come about in Lancashire. Sir Alfred Jones, whose name is well known to everybody, not only in Liverpool and Manchester, but in all parts of the world, sent out large quantities of seed, some of which was sent to me, and I had it planted under the supervision of an expert from the Southern States of America. We did very well, raising beautiful cotton, and there is no doubt that as soon as we can interest the people in the growing of this

cotton we shall be able to grow very large quantities. The potentialities of that part of the West Coast with which I am associated are enormous. There is no over-estimating the value of the place. There is nothing speculative about it. I will only add that when you go away to-night I hope you will give a thought to the great work which is being done by the Government of the Colonies of West Africa and do what you can to make the places prosperous. By doing that and finding work for these native people, you will be helping to uphold the dignity of the great Empire to which you and I have the privilege and honour to belong.

Mr. H. G. HUMBY (consulting engineer in London to the Natal Government) wished to correct a statement made by Mr. Shelford in the course of his remarks to the effect that the Natal railways had cost £14,000 per mile. This was absolutely incorrect. Mr. Shelford might have taken from some Blue Book the capital cost of these railways, and divided the total by the mileage. If he had done so, undoubtedly these railways would appear to have cost a large sum, which in reality they had not, the reason being that the capital expenditure included the reconstruction of some 250 or 300 miles, and various other alterations that had been effected. To compare the West Coast Railways with Natal was something like comparing the Festiniog Railway with the North-Western or the Great Northern. As an old railway engineer, he appreciated all the difficulties set forth in Mr. Shelford's Paper, and he thought great credit was due to the engineering staff for having overcome those difficulties in the way they had in so short a space of time.

The CHAIRMAN: I now move a vote of thanks to Mr. Shelford for his interesting Paper. We have listened with the greatest satisfaction to the many new and striking points in connection with railway construction about which he has told us, and we have greatly admired the numerous photographs, some of which, I have no doubt, were taken with a considerable amount of trouble. It has been to me a source of great gratification to be present this evening, and I am sure I am expressing the views and wishes of everybody present when I tender to Mr. Shelford our hearty thanks.

Mr. FRED SHELFORD: I am in the position of having laid before you some facts and figures illustrated by maps, cartoons, and lantern slides, showing the work carried on in West Africa, and in the discussion which has followed I have listened with interest to remarks from officials of high standing. I am extremely obliged to those gentlemen for the remarks they have made and the informa-

tion they have given us. The Chairman mentioned that the average amount of railway constructed during the last ten years has been at the rate of 50 miles a year. That is perfectly correct, but it covers, of course, all the halts which occurred. For various reasons it may be interesting in this respect to remark that the average speed which can usually be maintained in railway construction in West Africa is about 6 miles a month—that is, 72 miles a year. I quite agree that, to compare the cost per mile of lines in certain countries with the cost in other countries is not altogether fair, because it is necessary to consider the conditions in each case, and to compare the cost in one Colony with the cost in another, where these conditions are perhaps wholly different, is misleading. The figures seem, however, to be demanded by the public. I did not deal with the question of the method of construction in my Paper, but I may mention that in the case of the Gold Coast, when we started, we had not an exact knowledge of even the length of the line. I thought it would be 180 miles, but it proved to be 168. Nor did we know how many streams were to be crossed, or what was the character of the country. You cannot very well enter into a contract upon information of that kind. With regard to extensions, the method of construction is a matter which will, of course, be carefully gone into by the authorities concerned. Having carried out these works “departmentally,” and having also had large experience of contract work, my firm has been in the position to observe one or two advantages of the departmental system of construction which I can point out. The system is that the Government itself makes the line, employing the engineering staff and purchasing the best materials. If any alteration is required, such as altering the route of the line or the position of a station, it is easily done, whereas when a contract is in force any alteration may mean a claim for “extras.” Moreover, in the case of a contract, there is always the danger of the contractor, on account of unexpected difficulties, coming to the end of his resources, whereas with the departmental system this cannot occur. I have to thank Sir Alfred Jones for the help he has given from time to time. As to the Natal Railways, the figures I gave were simply the best that I could obtain, and they do not seem far wrong. The railways may have been reconstructed since the first opening; the fact remains that their present excellence entailed an expenditure of a large amount per mile. I will now ask you to give a hearty vote of thanks to the Duke of Marlborough for his kindness in presiding at this meeting.

The CHAIRMAN responded, and the proceedings terminated.

MARCH.

1899.

ANNALS
OF THE
AMERICAN ACADEMY
OF
POLITICAL AND SOCIAL SCIENCE.

THE REGULATION AND NATIONALIZATION OF
THE SWISS RAILWAYS.*

*The Origin of the Law of 1852.—Introduction of the System
of Private Railways.*

During the period from 1813 to 1848 Switzerland was a loose confederacy of small, almost entirely independent, states, whose central government possessed no original powers over internal affairs. It is clear that such political conditions were highly unfavorable for the projection of great public works whose compass would extend far beyond the limits of individual cantons. Indeed, the thirties and forties were continually occupied with political struggles and disturbances which absorbed both the energy of the country and the attention of the government. We can understand why the development of railways began much later in Switzerland than in most other European states if we remember that the country was poor in natural resources, that trade and industry were confined to a few municipal cantons, and that climate and soil offered serious

* Translated from the German by B. H. Meyer, Ph. D., University of Wisconsin.

obstacles to railway construction, technically but imperfectly developed. As a matter of fact, the first railway was not opened until June 15, 1844, and this was a line, 1.8 kilometers long, from Bâle to the French boundary at St. Louis. Three years later, in 1847, followed the Northern Railroad, from Zurich into Baden, with a length of 23.3 kilometers.

In 1848, the federal constitution was so revised as to meet the requirements of the age, and a firm central government placed over the cantons. Although the sovereignty of the cantons remained unimpaired the central government was entrusted with a number of important powers. Article 21 of this constitution provides that:

“The federation shall have power, in the interests of the *Eidgenossenschaft* or of a large part of the same, to erect or to aid in the erection of public works at the expense of the *Eidgenossenschaft*.

“The federation is also authorized to exercise the right of expropriation, full compensation being given. Detailed provisions concerning expropriation are reserved for federal legislation.

“The federal assembly may prohibit the erection of public works which prejudice the military interests of the *Eidgenossenschaft*.”

Upon the basis of this article the federal assembly of 1849 requested the *Bundesrat* to submit to it data upon the following propositions:

1. A plan for a general Swiss railway network, and on consultation with disinterested experts, a plan for undertaking the preliminary technical work.
2. An outline of a federal law concerning expropriation for Swiss railway construction.
3. Opinions and propositions relating to the participation of the federation in the construction of a Swiss railway network.

It was the prime motive of the federal assembly to provide for the systematic and energetic building of railways in Switzerland, leaving open the question whether the state or private individuals should undertake the task.

The *Bundesrat** did as requested. It ordered exhaustive opinions to be elaborated on the technical and financial basis of railway construction, and for this purpose called two eminent authorities from England, Robert Stephenson and Henry Swinburne.

Meanwhile the *Bundesrat* itself brought before the councils an expropriation law, the federal law concerning liabilities for the surrender of private rights, which went into effect on May 1, 1850, and which has remained in force unchanged till the present time. Article 1 of this law stipulates that

“when in accordance with Article 21 of the federal constitution public works are erected on the account of the federation, or when the application of this federal law to other public works has been decreed by the federal assembly, everybody shall be in duty bound, in so far as such public works may necessitate the same, to cede his property or other rights to immovables, temporarily or permanently, in return for full compensation.”

This article contains the essentials of the law, which, in addition, regulates numerous questions of detail and procedure that find their application in the execution of the law on expropriation. With this the foundation for Swiss railway legislation has been laid; for, as we shall see below, the expropriation law was soon declared applicable to railway building in a generally binding form.

During the autumn of the same year (1850) the experts submitted their report. The technical opinions elaborated by the two Englishmen contained a plan for a Swiss railway system, 650 kilometers in length, and recommended the execution of the same by the state. The experts on finance believed likewise that a Swiss railway system could not be brought into existence without the co-operation of the state, but they were divided in their opinions as to the form

* The *Bundesrat* is the federal executive. It is a committee chosen by the federal assembly in joint session. The federal assembly is composed of two chambers, *Nationalrat* and *Ständerat* (national council and council of states), which are frequently spoken of collectively as “*Räte*” (councils).—*Translator*.

which this co-operation should take. One proposed building through the joint agency of the federation and the cantons; the other, building by private individuals with a guarantee of a certain minimum revenue by the state.

Based upon these preliminary estimates, the *Bundesrat* brought a draft of a railway law before the federal assembly in 1851. This law provided for the building of the network of railways, proposed by the technical experts, through the joint agency of the federation and cantons, although the *Bundesrat* asserts in its message* that it would have preferred building by the federation alone had it not been restrained by financial considerations. The pecuniary resources and revenues of the federation were extremely limited, and it was thought at this time that the operation of railways would certainly involve a deficit. It was for this reason that the *Bundesrat* proposed that the designation of the projected lines and the determination of the conditions under which these should be built and operated within the domain of the *Eidgenossenschaft* should be left to the federation (Art. 1); while the construction itself and operation should be the joint undertaking of the federation and of the cantons (Art. 7). This participation was planned in such a manner that the requisite funds were to be raised by issuing Swiss railway partials† upon which the federation was to guarantee a certain minimum rate of interest, while the cantons were to reimburse the federation, to the extent of two-thirds, for whatever contributions it might be compelled to make in consequence of the interest guaranty. Naturally only those cantons would have been drawn into account which were touched by the railway in question. Any surplus above the guaranteed interest was to be participated in by the holders of the partial obligations.

* Propositions relating to laws and resolutions, which the *Bundesrat* submits to the federal assembly, are regularly accompanied by an explanatory report, called a message, *Botschaft*.

† Partial or partial obligations are bonds divided into parts and supplied with continuous numbers. Brockhaus' "*Conversations-Lexicon*."—Translator.

The administration of every individual enterprise was to be undertaken by an administrative council, elected in part by the federation and in part by the cantons, and which was to have appointed a tolerably independent directory for current business. Provisions were also made for concentrating several different enterprises under one administration or directory. In addition, there was to be created a permanent commission, elected by the federation, for the revision of the accounts of all the railways.

Both the national council and the council of states referred this bill to commissions for criticisms and opinions. The national council received its report first. This commission was divided in its opinions. The majority supported the point of view of the *Bundesrat* but went even farther and gave a less qualified sanction to the idea of state control in railway matters. The minority desired to leave railway matters with the cantons or private individuals.

The majority, whose report was a lengthy and excellently written defence of the state railway system, advocated the following postulates: (1) railway transportation is a state business, and the state should raise the necessary capital; and (2) the location and building of the Swiss railway system and its organization for construction and operation are subjects for federal legislation.

These claims were strongly supported upon economic and political grounds. At the same time the majority accompanied the bill of the *Bundesrat* with the draft of a law worked out by its own members. In accordance with this scheme the establishment of the Swiss railway system and its organization for purposes of construction and operation were to be exclusively the concern of federal legislation; the actual construction and operation, however, was to be the common business of the federation and of the participating cantons. The payment of interest on the capital stock, which was to be raised by four per cent federal loans, without sharing the profits with bondholders, was to be borne

equally by the federation and by the cantons. The *Bundesrat* and a general directory subordinate to it were to be the highest administrative organ. The entire network of railways was to be divided into six circuits, each under the direction of an administrative council of from five to nine members—two elected by the *Bundesrat* and the others by the cantons in proportion to their participation in the enterprise; and each administrative council was in turn to elect a directory for its circuit.

The minority of the commission attempted to refute the arguments of the majority report in favor of a state system and to prove that the building of railways for Switzerland through private means, without any assistance from the state, was not only possible but extremely advantageous. Like the majority, the minority embodied its views in the form of a bill which need not be discussed here because it formed the foundation for the first railway law, the contents of which will be presented below.

The national council decided in favor of private enterprise, accepted the report of the minority by a vote of 68 to 22, on July 8, 1852.

In this manner "The Federal Law concerning the Construction and Operation of Railways in the Domain of the *Eidgenossenschaft*," of July 28, 1852, was enacted. The law remained in force unchanged till 1872. This interval of twenty years may be regarded as a closed period in the history of Swiss railways, especially in the history of the relation of the railways to the state. It is characterized by the supremacy of the cantons in railway affairs. The powers reserved to the federation are very insignificant. But since the cantons were small and weak they soon realized their inability to exert an appreciable influence on the development of the railway system. The companies, which, of course, were organized, in the face of the apprehensions of the majority of the commission of the national council, soon learned how to withdraw themselves from the

guardianship of the cantonal governments; but the federal government, in spite of its insignificant powers, did not lose sight of them. In proportion as the companies grew larger and more influential, as the railway network was enlarged and extended, as traffic increased in volume and significance—which it did at a rate that no one had anticipated—the necessity for a change in federal legislation and for greater supervision and participation in railway matters on the part of the state increased. This development received its last complement in the federal law of October 15, 1897, which ordered the repurchase of the railways. It is a long step between the laws of 1852 and 1897. It is necessary to follow out here the manner in which the revolution in public opinion with reference to the relation of the state to railways was gradually brought about, in order to show subsequently how legislation developed harmoniously with these changes.

The Development of the Idea of State Railways.

Article 1 of the railway law of 1852 reads:

“The construction and operation of railways within the domain of the *Eidgenossenschaft* is left to the cantons, or, when suitable, to private activity.”

while Article 1 of the law of October 15, 1897, says:

“The federation may purchase and operate on its own account, under the name of ‘Federal Swiss Railways,’ all those Swiss railways which, because of their economic or military significance, serve the interests of the *Eidgenossenschaft* or of the major part of the same, when these can be acquired without making disproportionate sacrifices.”

To be sure, there were private Swiss railways before the law of 1852, and such will probably exist following that of 1897, because it will be several years before the transfer of the railways to the federation can be made possible. Yet we may designate the two laws just cited as boundary posts which mark off the system of private railways.

The development of these forty-five years was neither sudden nor spasmodic. The idea of state railways had succumbed, but it had not been destroyed. As early as 1857, on the occasion of a report to the *Bundesrat* relating to Swiss railways, the department of post and building incidentally discussed the question of repurchase and submitted the following propositions:

1. The repurchase of the Swiss railways by the federation is desirable as a matter of principle.

2. In consequence of the above mentioned joint proceedings this repurchase is to be attempted immediately; and, in this case, proposals are to be submitted to the companies in accordance with one of the three following systems: (*a*) shareholders may exchange their stock for government bonds bearing a fixed rate of interest and redeemable within a certain number of years; (*b*) or, there may be granted to shareholders, in addition to the stipulated rate of interest on bonds, a portion of possible surplus revenue for a definite number of years; (*c*) or, instead of this portion of the surplus revenue a fixed annual sum, *e. g.*, one-half per cent of the total capital may be paid to shareholders in lottery premium certificates.*

3. There shall also be kept in view, even at the present time, the repurchase of the railways at the expiration of the first period of thirty years for which charters have been granted, and for this purpose the following provisions shall be made: (*a*) there shall be paid annually into the federal treasury a certain sum which shall constitute a repurchase and amortization fund; (*b*) this repurchase fund shall be applied to the acquisition of Swiss railway stock rather than be put out at interest; (*c*) in case of a possible general fusion the federation shall strive to assume all new stock which may be issued.

This movement did not make further progress. Its purpose appears to have been accomplished with the conclusion of the deliberations of 1852. The expectations of the friends of private railways were being fulfilled in a brilliant

* The author uses the term *verloosenden Prämien*. These "premiums" are obligations or bonds issued for loans, the payment of interest upon as well as the amortization of which "ensues in part or entirely in accordance with a definite scheme of drawing on the lottery plan." The holders of these obligations are paid off whenever the bond which they own is "drawn" by lot. Compare Brockhaus' "*Lexicon*."—Translator.

manner. In a few years there came into existence an extensive network of railways which overspread nearly the whole country, and which was much more dense than the system of state roads that the federation had originally projected.

The first vigorous voice which again was raised in behalf of a state system was that of Stämpfli, president of the federation, who, in 1862, in a pamphlet which attracted an extraordinary amount of attention, advocated the repurchase of the railways by voluntary agreement with the companies. As early as 1857—and this is but little known—Stämpfli had presented a memorial to the *Bundesrat* in which he explicitly supported repurchase. This body, however, gave no support to his propositions.

Stämpfli, well known later as president of the tribunal of arbitration in the Alabama claims of the United States against Great Britain, maintained that the existing railway conditions were unsound and that the excessive scattering of energy was injurious to society, to the public and to the state. He declared, however,

“in order to avoid every possible misunderstanding,” that “because of the nature of existing charters repurchase is possible only by means of voluntary agreements, and that no other method has entered my mind.”

Yet such a repurchase was to be attempted forthwith. It is true, Stämpfli's voice, which was persistently interpreted as a purely private utterance, died away without any direct results; but the impression which his keen project had made and the authority which the great statesman justly enjoyed, long remained so influential that every movement in behalf of nationalization was attached to Stämpfli's name, and every possibility of repurchase according to charter provisions appeared to be excluded for all future time. As a matter of fact, no serious proposition for the accomplishment of nationalization on the basis of the respective charter provisions was made until the year 1897, when the idea

was realized. The state became only gradually conscious of the advantages which had been placed in its hands when it had been authorized to legislate for repurchase in accordance with charter provisions.

Stämpfli made nationalization a positive quantity. His pamphlet shortly called forth a series of replies, which he met in a second edition. His ideas also found independent supporters who sought to elaborate his views and to give them a more practical form.

Meanwhile the period of excessive zeal for the extension and development of the Swiss railway system had been followed by a season of business depression, a general railway crisis, which affected not only all railway companies but also the financial interest of most remote sections of the country. During this critical period the eyes of many were once more turned toward the state, and the acquisition of the railways by the federation—be this by way of agreement or of expropriation (Dietler, 1877), or even in the form of state operation with private ownership (Zschokke, 1877)—was again characterized as the safest way out of the then existing unhealthy conditions in railway affairs. It can furthermore not be doubted that if the state, during this period of depression, had followed the advice of experienced and far-sighted men and acquired the most important lines of railways, it would have come into possession of a great network on remarkably favorable terms.

The state did not venture to take this step. The notion of state railways had not yet struck root either in the leading circles or among the masses. The political ideas obtaining at that time did not tend toward a considerable increase of the federal power; likewise the economic views of the times were overwhelmingly averse to increased state interference in industrial matters. For this reason, on June 6, 1877, the council of states rejected a bill which provided as follows:

"The *Bundesrat* is requested to subject the question of what, if any, changes are to be made in the existing railway legislation in the light of recent experiences in Switzerland, to an exhaustive investigation; and in case the *Bundesrat* should conclude that public interests demand a modification of the laws, it is requested to accompany its report by a suitable bill."

On June 19, the council of states approved the following motion:

"The *Bundesrat* is requested to order an investigation which may determine whether in view of past experiences and of the present state of affairs it is expedient for the federal government to inaugurate reforms in Swiss railway affairs."

There was a lack of courage and confidence. The situation of the railway companies appeared to be too critical and hazardous to make it desirable to put the federation in their place. It was thought that enough had been done through the laws of 1874 concerning railway mortgages and forced sales, the transportation law of 1875, the adoption of uniform transportation regulations in 1876, and the law of 1878 relating to the subvention of Alpine railways. The reorganization of the Swiss railways was left to private initiative and private capital just as had been done twenty-five years earlier when the first railways were built.

It can not be said that people were deceived in their expectations. Thanks to the strenuous endeavors of administrative officials, the manifold support of foreign capital, and the favorable influence of the Gothard Railway which had meanwhile been opened for traffic, an improvement in the conditions of most of the railways was perceptible in a relatively short time.

After the *Bundesrat* had relinquished, in 1877, repurchase on the basis of voluntary agreements or by means of expropriation legislation, it was soon confronted by the question as to what attitude it should take toward the repurchase of a number of railways whose charter limits expired on May 1, 1883.

A thorough examination of the circumstances, inspired perhaps still by the influence of Stämpfli, convinced the *Bundesrat* that it was not best to take advantage of its right of giving notice of intent to purchase at this time.* In the message that accompanied this resolution when it was submitted for the approval of the councils, the *Bundesrat* very urgently called attention to the difficulties involved in the repurchase of railways according to charter provisions. It pointed out, especially, the indefiniteness of the two fundamental notions, "capital stock" (*Aulagekapital*) and "net profits" (*Reinertrag*), and the impossibility of accepting the accounts of the railway companies as a basis for the determination of the purchasing price.

The council of states approved the resolution of the *Bundesrat* on April 4; and the national council did the same on the twenty-first of the same month, although it did so by a vote of only 67 to 59. Indeed, the majority of the commission, to which the investigation had been entrusted, reported in favor of the purchase of at least the Swiss Central Railroad and its associated lines.

This momentous problem of repurchase was not yet thought to be sufficiently clarified to be solved in the affirmative contrary to the best judgment of the *Bundesrat*. But apart from this, economic and political doubts concerning the principle of state railways were yet so strong that the council of states would hardly have given its approval to a resolution of the national council in favor of nationalization. The proceedings in this matter brought to light very clearly the fact that the rank and file of those who were fundamentally opposed to a state railway system had become more enlightened. Hereafter, men scarcely dared openly to announce themselves as unqualified opponents of a state system, but rather strove to push the practical difficulties into the foreground, and thus make it unnecessary for them to commit themselves on the question of principle.

* Federal resolution of March 6, 1883.

This gradual change in opinion was naturally intimately associated with the contemporaneous change of views concerning the relation of the state to the public economy. The statesmen and politicians of the year 1883 were even then inclined to extend the activity of the state much farther than would have been considered admissible thirty years previous. Faith in the superiority of absolute freedom of the individual in the domain of economic phenomena, which had been considered the inseparable correlate of political freedom, had been greatly shattered. Men had begun to reconcile themselves to the interference of the state in all spheres of practical life. The activity of the state in promoting trade and the public defence, agriculture, industry and especially labor, education and sanitation; in regulating and correcting the flow of water in meadow and mountain; in extending streets and Alpine paths, and the telegraph and postal service; and, last, but not least, the extended powers which the state already possessed in the domain of railway transportation—about which more will be said below—no longer permitted the transfer of the railways into the hands of the state to appear as an innovation having deep and fundamental significance. Only the practical question *how* was left unanswered.

Of course, the attitude of foreign countries toward railway problems was not unnoticed and it created a lively impression and lasting influence on the views of influential persons and on the opinions of the people of Switzerland. It was during these years that a strong tendency toward nationalization of railways asserted itself over the entire European continent.

Belgium, which had accepted the principle of state roads at the outset, but had subsequently, for reasons of expediency, left the extension of its railway network to private activity, carried out most vigorously the policy of repurchase from 1870 to 1880. Of the total mileage of Belgian

railways in 1870 there were in the hands of the state about 43.5 per cent, or 745 kilometers; in 1880 this had increased to $65\frac{1}{4}$ per cent, or 2568 kilometers; and in 1888 it reached $72\frac{1}{4}$ per cent, or 3200 kilometers.

In Prussia the nationalization of railways was vigorously prosecuted after the year 1876. From this date to 1890 the state acquired about 14,000 kilometers of private roads; and of these upwards of 10,000 kilometers were taken between 1876 and 1884.

Austria, which at one time had shifted from state to private operation, likewise changed its railway policy during this period; and, by enacting the law of December 14, 1877, inaugurated a new epoch of state railways. By the close of 1879 the state had acquired 950 kilometers of private roads. At the end of 1892 this network had been increased to 7581 kilometers, partly by the purchase of existing railways, partly by building new lines and partly by the of operation private roads.

Hungary, whose state system embraced 603 kilometers in 1872 and twenty years later 9810 kilometers, pursued a similar policy.

In France, after protracted debates, in 1877, the legislature authorized the government to purchase a number of lines, mostly suffering ones. A system of 2615 kilometers passed into the hands of the state in 1878.

Likewise the countries bordering Switzerland on the north—Baden, Württemberg and Bavaria—possessed a part of their railways from the first, and they changed over to a state system during this same period.

These events must have exerted a strong influence in Switzerland. They did not permit the movement toward nationalization to come to a halt. The movement also gained a powerful friend in Welti, for many years the director of the department of railways and a member of the *Bundesrat*. He used his influential position with much effect to promote the policy of nationalization.

Attempts at Nationalization previous to 1897.

Since repurchase in accordance with charter provisions was considered too difficult, the *Bundesrat* attempted to approach the desired aim by way of voluntary purchases. During December, 1887, the *Bundesrat* consummated an agreement for the purchase of the Northeast Railroad. In accordance with this agreement the Northeast Railroad Company was to cede to the federation all its movable and immovable property and receive in return, at their nominal value, Swiss (*eidgenössischen*) bonds bearing $3\frac{1}{2}$ per cent interest, at the rate of 600 francs for each preferred share and 500 francs for every common share. The general meeting of shareholders ratified the agreement but demanded additional concessions, apparently of little significance. The *Bundesrat*, however, seized upon this opportunity to withdraw from the negotiations, presumably because of its solicitude about securing a majority vote in the federal assembly.

A few years later they went one step farther with reference to the Jura-Simplon Railroad. After the *Bundesrat* had reserved for itself the right, when the fusion of the *Suisse occidentale* and the Jura-Bern-Luzern railway companies had been brought about, to exempt all shares which it might eventually possess from the restriction on voting in the general meeting (according to Swiss law not more than one-fifth of the whole number of votes can be concentrated in the same shareholder) it resolved, in 1890, to purchase 30,000 preferred shares of the above company, which were at that time owned by the canton of Bern. The purchasing price amounted to 600 francs (per share of 500 fr.), *i. e.*, 120 per cent, payable in 3 per cent bonds quoted at 90. Similar purchases were repeated, so that by the close of 1891 the federation possessed 77,090 preferred shares of the Jura-Simplon Railroad. Financially the result was not

favorable, and the anticipated influence on the authorities of the Jura-Simplon Railroad was not secured; consequently no additional purchases of this stock were made after 1891.

A third trial was made with the Central Railroad. The *Bundesrat* negotiated at first with an association of shareholders of the company concerning the cession of a large installment of stock, and later with the directory itself for the purchase of the entire railway. In June, 1891, the federal assembly empowered the *Bundesrat* to execute a contract for the transfer of the Central Railroad at a price of 1000 francs for every share of 500 francs payable in 3 per cent bonds quoted at par. However, these terms seemed so unfavorable for the federation that the referendum was resorted to, and, on December 6, 1891, the contract was rejected at the polls by a large majority.

These consequences demonstrated more clearly than had at first been assumed that not only a certain aversion to the principle of nationalization but also, and much more, the special conditions of a concrete case condemned the bill.

As early as January 29, 1892, the federal assembly passed a resolution requesting the *Bundesrat* to institute a comprehensive investigation of the railway problems (railway reform and railway repurchase) and to submit a report, accompanied by a bill, on the ways and means by which to proceed.

The outcome of this investigation, which the *Bundesrat* soon took in hand, was the accounting law (*Rechnungsgesetz*) submitted November 2, 1895. The *Bundesrat* had reached the conclusion that the accomplishment of nationalization was desirable, that the next possible opportunity for repurchase in accordance with charter provision in 1903 was preferable, but that existing laws were inadequate for the solution of preliminary problems, such as the determination of the price, etc., and that therefore they must be amended.

This accounting law is the last link in a long chain of legislative enactments through which the relation of the state to the railways has been gradually modified in the direction of increased state influence. The laws are an expression of the gradual development of the idea of state railways. Nearly all these laws, except the last and the most decisive one, were passed without appreciable opposition, and this is proof that their tendency on the whole ran parallel with the transformation of public opinion on the economic functions of the state. When finally the last step, the change to the state system, was to be taken, it was found that the way had long been prepared.

Guided by this legislation we may now study the relation of the state to railway companies up to the time of the enactment of the repurchase act.

Railway Legislation from 1852 to 1872.

The expropriation law of 1850 has already been mentioned. It was the first result of the task which the federal assembly had assigned to the *Bundesrat*, and which was discussed above.

The next and most important consequence of the same report was the "Federal Law Concerning the Building and Operation of Railways in the Domain of the *Eidgenossenschaft*," of July 28, 1852. It was modeled, as has already been stated, after the minority report of the commission of the national council. The following were the essential contents of this law:

The building and operation of railways in the domain of *Eidgenossenschaft* is reserved to the cantons, or to private activity.

Charters for railway enterprises emanate from the cantons, subject to the approval of the federation through the agency of the federal assembly (Art. 18).

The federation must grant this approval if the projected enterprise does not prejudice the military interests of the *Eidgenossenschaft*. But it has the power to decide whether this is the case or not. So far as the author knows, it has never happened that railway charters have been refused for purely military reasons, even though apprehensions of this nature have repeatedly been uttered in discussions on applications for charters.

The law, however, makes the granting of charters depend upon the fulfillment in favor of the *Eidgenossenschaft* of certain conditions relating to the administration of the postal system, the telegraph and the army. They are the following: (1) Railways are bound to transport free of charge letters and sealed packages up to a weight of 5 kilograms. Likewise railway post-offices and postal clerks must be carried gratis. (2) Railways are required to permit the establishment of telegraph lines along the railways without compensation, to direct and supervise the construction and the more important repairs of such lines through their own engineers, and by means of their own staff to make lesser repairs and to maintain the line. (3) Railways are compelled to transport the *Eidgenossenschaft's* army and accoutrements of war at one-half of the lowest regular rates.

In addition, the *Bundesrat* reserved the right to declare a charter null and void if the work of grading was not begun within a specified time and proof given of the company's ability to execute the work in a proper manner. It also reserved the right to prescribe regulations that might be necessary to insure the technical unity of the Swiss railway system. The *Bundesrat* further reserved the right to decide disputes among railway companies over the manner of making junctions with one another. The law provided that every railway company should be in duty bound to permit the establishing of convenient junctions, without the company requiring the rates of the roads making the junctions to be kept at a lower level in its favor.

Finally the *Bundesrat* reserved the power to participate in the negotiations between the cantonal governments and private parties concerning the granting of charters, which right it has, however, never exercised, because the law did not accord to it a dominant position in these negotiations. In case a canton should attempt to prevent or to make more difficult the construction of a railway of importance to the public, the federal assembly was empowered to interfere of its own accord and to order what seemed necessary. It is not very clear just what was to be understood by the "necessary" which, under such circumstances, the federal assembly was empowered to order; and it is at least very doubtful whether the establishment of railways by the *Eidgenossenschaft* was intended.

As compensation for these responsibilities the railways were empowered to apply the expropriation law of 1850 everywhere in the domain of the *Eidgenossenschaft*; besides they were to be allowed to import for a period of ten years, free of duty, rails and other materials required in railway construction, such as wheels, axles, locomotives and coal.

The law was not sufficiently precise in such important provisions as those relating to repurchase. It was content with retaining the possibility of repurchase by the *Eidgenossenschaft* and postponed to a subsequent date the adoption of specific terms. Article 14 of the law provided that

"the time limits at the expiration of which the federation may purchase for full compensation the railway in question, together with the material and supplies belonging thereto, and the terms upon which repurchase may take place, shall be determined from time to time and for each case by itself."

It was clear that the federal assembly would soon be forced to take a stand on this question of charters. As a matter of fact, during the very session in which the railway law was enacted a series of cantonal charters were introduced for its approval.

These bills related to railways that had been chartered by the authorities of the cantons of St. Gallen, Thurgau, Waadt and Luzern. During the discussion on the applications for these charters the friends and foes of a state system contended with vigor. Some sought to incorporate in the resolutions approving the charters provisions which would make it easy and advantageous for the state to repurchase the railways; others took pains to give the longest possible life to the system which they had only recently created.

Various bills designed to solve these difficult problems were brought before the federal assembly. The *Bundesrat* proposed to fix the terms of repurchase in the following manner:

“The federation shall have power to acquire, for full compensation, all railways, together with the materials, buildings and supplies belonging thereto, after the twentieth year of the operation of the same, and on giving the respective railway companies one year’s notice.”

But the federation could not make use of this right before the expiration of the charter period, which was fixed at ninety-nine years.

The amount of compensation was to be ascertained exclusively on the basis of (*a*) the average net profits of the road during the last twenty years; (*b*) the original capital stock of the road and of its dependent lines; (*c*) the estimated sum which the construction and equipment of the road would cost at the time of purchase.

From the sums paid by virtue of *b* and *c* a reasonable deduction was to be made as an allowance for the past wear and tear of the railway. Should the federation desire to exercise its right of repurchase before the expiration of the charter limits—that is, between the twentieth and ninety-ninth years—then the price was to be advanced ten per cent. When an agreement between the federation and a railway

company could not be reached, a court of arbitration was finally to fix the purchase price on the basis outlined above.

The council of states first deliberated upon the bill, and, with unessential modifications, approved the scheme of the *Bundesrat*. The national council, on the other hand, engaged in a lively discussion which finally led to the adoption of the following repurchase clauses:

1. The federation shall have power to repurchase a railway at the termination of the thirtieth, forty-fifth, sixtieth, seventy-fifth and ninetieth years, and at the expiration of the charter in ninety-nine years.

2. As an indemnity against the exercise of this power there shall be paid twenty-five times the average net profits for the ten years immediately preceding the repurchase in the thirtieth, forty-fifth and sixtieth years; in the seventy-fifth year twenty-two and a half times, and in the ninetieth year twenty times this average; but in all cases an amount equal at least to the original capital stock shall be paid. Repurchase in the ninety-ninth year should be made by a reimbursement equal to the probable cost of the road at that time.

3. The road was to be transferred in a thoroughly satisfactory condition; and should it not meet these requirements a corresponding reduction was to be made from the amount awarded as an indemnity.

4. Disputes as to the amount of the award were to be submitted to a court of arbitration composed of two members appointed by each of the parties in the controversy, and these four were to choose a fifth as chairman. Should the arbitrators fail to agree upon a chairman the *Bundesrat* was to nominate three persons from whose number the plaintiff might first strike out one, then the defendant another. The remaining nominee was to be the chairman.

These propositions were finally approved by the council of states and this approval laid the foundation of Swiss railway legislation for many years to come. The law, whose contents have been indicated above, fixed the rights and duties of the state toward the railways. It still required elaboration. The adoption of the repurchase clauses was the first step in this direction. These, however, did not constitute a part of the law, but were merely resolutions of the federal assembly which were incorporated in the acts of

the federation for the approval of cantonal charters. After an agreement had been reached concerning the contents of these charters the resolutions were applied in tolerably uniform manner for all charters of standard roads granted by authority of the first railway law.

All further regulation of the legal relations of railways, in so far as they had not been provided for by the federal law of 1852, was left to the cantons.

In this connection it is, of course, quite impossible to enter upon a more detailed account of the manner in which the cantonal governments made use of their legal rights in the domain of railway affairs. The results of the exercise of these rights, however, are very small and their practical effect a vanishing quantity. In the nature of things the tendency would be not to obstruct the construction of international railways by means of exhaustive legal provisions which, because of the great difference in the conditions in the various cantons, could not well have been enacted.

The cantonal charter acts, on the other hand, were much more detailed and thorough. As a rule they contained careful directions concerning the approval of plans and the beginning, duration and nature of the construction. They required all plans to be submitted to the government. The construction of passenger coaches, the number and speed of trains and maximum rates were prescribed and provisions made concerning the policing of the railways. The companies were required to charge equal rates for all, and to grant favors to no one which could not be secured, under the same circumstances, by everybody else. A transfer of the charter was usually dependent upon the approval of the cantonal governments. The cantonal governments also reserved special rights of repurchase, modeled after those of the federation, but naturally inferior to them. The Canton of Bern alone exercised this right to a considerable extent, and it later sold its roads to a private company. The

railways, however, in addition to considerable financial support, received from the cantons numerous favors, two of which have special significance. One was the assurance that no other road should be chartered in the same direction or region; the other, exemption from cantonal and communal taxes. (The *Eidgenossenschaft* levies no taxes.) The "monopoly rights" against other roads led to numerous complications and later on, after the power to grant charters had been vested in the federation, the *Eidgenossenschaft* declared them not binding. Roads upon which the right of exemption had been bestowed at that time still enjoyed this privilege. Up to date the federal courts have defended them in the possession of this right against all attacks of the cantons; and since the railway companies have been placed in fair and, in some cases excellent, financial condition, these attacks have not been wanting.

Lastly, most of the cantonal charters took advantage of the right which the law of July 19, 1850, concerning exemption from military duty, had conceded to them, a law exempting railway engineers and machinists from military service. Experience, however, soon demonstrated that this exception to the principle of general military duty did not adequately meet the needs of the traffic; and so, by a federal resolution of July 20, 1853, the *Bundesrat* was authorized to determine for each railway separately, who among the employes, upon whom devolved the care of the safety of operation, should be released from the performance of the general military duties. This permission was granted only with the greatest possible restrictions, but with the introduction of the new military organization, exemption has been extended to all persons employed in the operation of railways.

These conditions can in nowise be characterized as ideal but the Swiss railways developed at a moderate rate. The demand for the new means of transportation had so long been checked by the unfavorable political and social conditions that, as soon as a certain degree of stability had been

brought about, the development of the net began. However, the legislation of the federation followed this development rather hesitatingly.

To carry into effect the provisions of Article 12 of the Railway Law, the *Bundesrat*, in 1854, issued an "Order Concerning the Technical Unity of Swiss Railways" which contained rather careful directions aiming to secure the greatest possible uniformity in construction and equipment. This order regulated the width of track, the radius of curvature, the height in the clear of tunnels, the maximum height and width of cars, the distance between wheel centres, the width of rims, etc. This unification of the equipment on Swiss railways was considered a military necessity.

The federal assembly took no further action regarding railway affairs for several years. In 1858, it declined to pass a bill relating to the regulation of the conditions of exclusion from Swiss Railways which the *Bundesrat*, in carrying into effect Article 13 of the law of 1852, had brought before it, because the *Bundesrat* possessed the necessary power to regulate those conditions "in the interests of the public traffic, the public service, as well as of the most efficient operation of the roads." So, also, in 1863, when numerous petitions had been presented from the business circles of several cantons praying for the removal of various evils connected with transportation on the Swiss railways, this body refused to act. This refusal was made because it was thought that a recent agreement among the different railway companies on uniform regulations would meet most of the complaints; also because it was the duty of the cantons rather than of the federation to interfere. The federal assembly also thought that the *Bundesrat* would be able to deal with such complaints should they continue to be made.

It is to be noticed that the federal assembly remained opposed to state interference in railway matters, although the people generally were demanding this interference.

This resolution of the national council was passed during the presidency of Alfred Eschers who was spokesman for the minority of the commission of the national council in 1852 and had defeated the idea of state railways.

But circumstances are more powerful than men. The federal assembly could not long resist the current of public opinion. During the summer of 1869, it requested the *Bundesrat* to submit a report and a bill granting additional powers to the federation in relation to the operation of railways.

At this juncture an event happened which not only contributed powerfully to direct public opinion towards the desirability of the participation of the state in railway transportation, but also showed to the federal assembly that, at least, under certain circumstances the state could not and dared not stand idly by and quietly watch the development of the railway system. In the extension of the network of Swiss railways the task of building over the Alps presented itself and proved too great for the combined efforts of the cantons and private persons. The *Eidgenossenschaft* had to conduct the diplomatic negotiations with foreign countries which were to aid the work by the granting of subsidies.

By the treaty of October 15, 1869, between Switzerland and Italy, which was later on accepted also by the North German Federation, the foundation of the Gothard enterprise was laid and at the same time powers were entrusted to the Swiss *Bundesrat* to execute the provisions of the treaty by means of the Gothard Railway Company. These powers gave the *Bundesrat* a very different position in relation to railway affairs than it had hitherto held.

The *Bundesrat* objected to the creation of two kinds of railway law, one for the Gothard Railway and the other for all the remaining railway companies; and hence it gladly responded to the invitation of the councils to submit the draft of a new railway law (1872) that would unify the railway code.

The Gothard Railway thus became one of the most important immediate causes that brought about an extension of the rights of the state in railway control. It is a most peculiar coincidence that for the many years of his restless activity for the inception of the Gothard Railway Alfred Eschers received a reward which rarely comes to an individual. The most pronounced and proudest champion of the independence of the railways from the state, the spiritual father of the railway law of 1852, now, without intending to do so, gave the most important impulse toward the new railway law of 1872.

The Railway Law of 1872.

The *Bundesrat* presented the draft of a new law together with a very elaborate report to the councils in 1871. This report characterized as an especially great evil the inability of the individual cantons to assert their authority against the greater railway companies. As a result of this inability there had arisen a series of misunderstandings and conflicts over the establishment of new lines or their transfer to third parties, over the regulation of junctions, the lack of harmony in time tables, rate questions and the arbitrary action of the companies in cases of liability. All these misdemeanors could be brought to an end only by the strong hand of the central government.

This report scarcely exaggerated existing conditions. There was the greatest incoherence in Swiss railway regulations because of inadequate federal legislation. There had clung to Swiss railways from the beginning a strong particularism and an inability to renounce, for the sake of the simplification and unification of its administrative machinery and traffic regulations, claims which were more or less just. The public was all the more inconvenienced by these conditions because the lines of the

individual companies were less extensive and their most important roads were only sections of prominent through routes. In this respect, however, conditions were improved little by little, partly through the consolidation of smaller companies; partly by the direct pressure exerted by the trafficking public or the state, and not least, by the continued exertions of far-sighted professional men. Nevertheless it is certain that the weakness of the railway companies and their inability to unite interests diverging in so many directions became fatal to them. They supplied the state with a welcome argument for, and a certain justification of the uninterrupted extension of its authority in the domain of railway affairs.

From the beginning the railway companies had denied to the federation the right to alter their legal status through legislation because this status rested on a private contract—the charter. In its message the *Bundesrat*, however, took a very decisive position against this conception by asserting that charters are one-sided acts of the state power which may be repealed or modified by the same authority. Nevertheless, it admitted that certain private rights grew out of charters which could not equitably be annulled without compensation. Such, however, were not in question here, because the *Bundesrat* was now dealing with provisions for the maintenance of public order, for the protection of individual rights of public traffic, of the safety and health of the people, and that all individuals, associations and corporations as well as the private citizen must be subordinated to these higher interests of civil society.

The law as it finally emerged from the federal assembly on December 23, 1872, is in four parts:

1. The granting of charters.
2. Contents of charters and the legal status of the incorporators.
3. Provisions concerning the unity of construction and operation of Swiss railways.
4. Questions of jurisdiction and transitional regulations.

As regards the granting of charters, power is to be exercised solely by the federation which must, however, previously consult with the cantons. The federal assembly may refuse to grant charters for railways which prejudice the military interests of the *Eidgenossenschaft*. A charter may be granted even against the protests of a canton, but in such a case the canton has a right to build and to operate the railway in question on its own account. The law stipulates that charters shall be granted only for limited periods of time and shall contain no rights of exclusion. The regulations of the railway companies, as well as every alteration of the same, require the approval of the *Bundesrat*. Charters are transferable only with the consent of the federation. The execution and authorization of liens on railways and the procedure in case of insolvency shall be regulated by a special federal law. The expropriation law applies to all chartered railways. A period of time shall be fixed within which the work of grading must be begun and evidence given of ability to continue the same under penalty of forfeiting the charter. (In practice, no objections were, as a rule, raised against an extension of this time limit on the application of the incorporators.) The *Bundesrat* shall also fix a term of years for the completion of the road, in violation of which, unless an extension is granted by the federal assembly, the same shall be sold at auction on the account of the company. All plans must be submitted to the *Bundesrat* for approval. This body has the right, in the interests of public safety, of traffic and of public defence, to order the construction of double tracks, new stations, etc. The federal assembly decides upon these matters in the last resort. For all demands exceeding the legal and concessional requirements the companies shall, within certain limits, receive compensation. During the period of construction and operation the railway company shall, at its own expense, take all measures necessary for the safety of traffic on existing highways, etc., and for the

protection of adjacent property from injury. The railway shall not be opened for traffic until after the *Bundesrat* shall have granted permission to do so. The *Bundesrat* shall previously authorize experts to inspect the road at the expense of the company. Following the completion of the road, plans and an inventory of the entire plant, in addition to a correct account of all expenses, shall be handed in to the *Bundesrat*. The same shall be done for later construction not falling under the head of maintenance and for the purchase of equipment. Railways are bound to transport mail free of charge. The federation may collect annually a charter fee proportionate to the net profits. In case of interruptions in traffic due to accidents provisional transportation of mails and passengers shall be provided for. The provisions relating to the construction and maintenance of telegraph lines are analogous to those of the law of 1852. In times of war the federation is authorized to take possession of the railways with all their equipment, compensation being given. During times of peace the army and accoutrements of war shall be transported at one-half the ordinary rates. Every year the companies shall transmit to the *Bundesrat* reports of their annual meeting, extracts from the reports of the general meeting of shareholders, and all material necessary for the compilation of statistics. The more detailed provisions concerning repurchase are to be stipulated in the charters. On non-fulfillment of legal and concessional obligations and the observance of a certain mode of procedure, a charter may be declared void and the road, together with its equipment, sold at auction on the account of the company.

The law further gives (Art. 29-38) the federation extensive powers for the establishment of unity in the construction and operation of Swiss railways. They extend to construction, equipment, manner of building, heating, lighting, condition of cars, minimum of equipment required of every railway, railway police, number of trains and

observance of train regulations, the adoption of uniform traffic regulations. Rates were completely subordinated to the control of the federation, which asserted the right to inspect all acts and contracts relating thereto. Nevertheless, the *Bundesrat* acknowledged in a message that rates were regulated less by the directions of the state than by the demands of traffic. Consequently it based its regulations on the two principles that all rates must lie within concessional limits and that no tariffs, not provided for in the charters, can be collected unless they have been expressly approved by the *Bundesrat* and publicly announced. Such publication, which is required for all changes in rates, shall be made at least fourteen days before the rates in question shall take effect. Finally, the federation reserved the power to legislate on matters pertaining to freight regulations and to the liability of railways for deaths and injuries connected with the construction and operation of the railways.

Such were the main provisions of the new railway law. They demonstrate that the federal assembly which enacted this law no longer occupied the ground of the federal assembly of 1852. The state at this time interferes vigorously with matters which twenty years before had been considered within the exclusive domain of private interests.

This law, however, did not terminate Swiss railway legislation; it was rather the first step in a new direction.

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—THE EDITOR].

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REGULATION AND NATIONALIZATION OF THE
SWISS RAILWAYS.—II.*

*The Extension of Railway Legislation on the Basis of the
Law of 1872.*

In connection with the law of 1872, the Bundesrat issued an "Ordinance concerning the proofs required to accompany applications for charters as well as plans and documents to be submitted before and after the construction of chartered railways" (1873), Article 27 of which goes to the utmost limits of what could be required of the companies on the basis of the railway law. In consequence of the law the organization of the Bundesrat itself had to be remodeled. The hitherto limited powers of this body concerning railways could be exercised without interference from the department of the interior; but this was no longer possible, and the Bundesrat proposed the creation of a special department of railways and trade. A law to this effect was enacted in 1873 and the following business was entrusted to the new department: (1) the chartering of

*For the first half of this paper consult the March ANNALS.

railways; (2) the supervision required to secure the complete and accurate fulfillment of the legal and concessional duties on part of the railway companies; (3) the negotiation of railway junction treaties with foreign countries.

This department, under which there was placed a technical and administrative inspector with the necessary engineers and corps of assistants, was subsequently reorganized and made the department of posts and railways with materially extended functions.

The new power to grant charters caused the Bundesrat some anxiety. It was of the opinion that the first charters to be granted by the federal assembly should be edited in such a manner as to serve as models for all later ones. Accordingly it drew up a bill which, together with a message, was submitted to the councils in 1873. The distinctive principle in this bill was that the applicants for new railway charters should not be placed in a less favorable position than the holders of those granted before January 1, 1873. Especially in relation to the provisions for repurchase, "which the federation had hitherto imposed upon itself, hard and heavy, over against the policy of other countries," did it believe itself to be bound to adhere to the principle of equal justice to all Swiss railways whether their birthday should fall before or after January 1, 1873.

In reality these repurchase provisions were not edited with entire conformity with acts approving the earlier charters, and at the present time controversies are waged between the federation and the companies as to the extent to which the older repurchase provisions may be called in to interpret the newer ones.

The charter bill of the Bundesrat, the so-called "normal concession bill," was adopted by the councils with minor changes, and in its essentials has served as a model for all subsequent charters of normal railways. Its provisions are, on the whole, like those of the railway law, but a few of the articles are so significant as to merit special notice. By

Article 1 existing federal laws, as well as all other directions of the federal authorities on the construction and operation of Swiss railways shall at all times be accurately observed.

Upon this the Bundesrat remarked that several petitioners feared a future interpretation of this article which would permit subsequent laws and ordinances to modify charter provisions at pleasure. Though this was not the purport, the article was intended to mean that federal railway legislation should stand above the charters.

Article 4 declared that a majority of the directors and of the administrative council or of other committees should be composed of Swiss citizens residing in Switzerland. Fear of the influence of foreign countries on Swiss railway affairs, because foreign capital had been largely employed in the construction and maintenance of the Swiss roads, has always influenced the railway politics of Switzerland and helped to create a sentiment in favor of railway nationalization.

Articles 10 and 11 concern the federal supervision of construction and operation. Article 12 fixes the minimum number of daily trains. Articles 15 to 25 treat of rates; that is, of maximum rates for passenger, freight and stock traffic, their approval of the Bundesrat and their publication. When the net profits reach a certain height rates are to be reduced. Article 27 contains repurchase provisions. To this we shall revert later.

The "normal concession" served only for a foundation of later charters and had to be supplemented, extended or restricted to meet individual cases. Thus, from the year 1885 on an article was incorporated directing the establishment of reserve and renewal funds as well as the institution of pensions and aids.

The succeeding years were extremely fruitful in railway legislation. Reference will be made to a few of the more important acts which were passed to supplement the law of 1872.

The federal law of 1874 concerning the mortgaging and foreclosing of railways, regulated the mode of procedure. The Transportation Law of 1875 deals with the liability of railways in the management of traffic and with the legal principles governing the passenger service. Its most important provisions relate to freight traffic, and contain a complete and unified codification of freight law applicable in all parts of Switzerland. It is the first federal enactment on this important question of civil law. The liability of railway companies for goods accepted for transportation is herein sharply defined. Only upon proof, which must be furnished by the railway company, that the damage was caused by the negligence of the shipper or consignee, by the character of the freight or by a Higher Power, can the railway free itself from liability. An exemption from liability by contract is not permissible. In consequence of the agreement of January 1, 1893, concerning international freight traffic, in the adoption of which Switzerland had from the first actively co-operated, this law has been superseded by the Transportation Law of 1893, which rests upon essentially the same legal principles.

The year 1875 also brought forth the law concerning the Liability of Railway and Steamship Companies in Cases of Deaths and Injuries, a law which adjusted the liability for damages due to accidents in transportation in a more rigorous manner than the general rules of civil law would warrant.

From this group of railway laws, all of which have their roots in the law of 1872, and have a certain inner coherency in so far as they are intended to regulate the relations of the railways to the trafficking public, there is to be distinguished another law which conceives railways more as public institutions in which the state has peculiar interests.

After the state had determined the legal relations of the railways to their patrons, it was still obliged to prescribe regulations relating to railway employes, to the organization or constitution of the corporations, regulations intended

to guard its own direct interests. From these three points of view also the railway legislation of this period must be studied.

(a) *Care of Employes.*—The previously mentioned liability law forms a natural transition to the group of laws which occupies us here because they not only fixed the liability of railway companies in case of accidents to third persons, but also—and what proved to be much more important—for accidents to laborers and employes of the road. The laws were the Federal Law concerning the Protection of the Sick, Aids, Pension, Deposit and Savings Funds of Railway Employes, as well as of the Security Required of the Latter (1878); the Federal Law concerning Aids-Funds of Railway and Steamship Companies (1889); the Federal Law concerning the Hours of Employment in the Operation of Railways and other Transportation Establishments (1890).

According to the last law the daily hours of labor for officials, employes and laborers of railway companies shall not exceed twelve, with a period of rest of one hour at the close of about half the labor period. The uninterrupted period of rest shall amount to at least ten hours for the machine and train personnel; for the remainder of the personnel, nine hours; or eight when they are domiciled in station houses or along the line. Officials, employes and laborers shall be free from duty for fifty-two days, properly distributed, during each year; and of these at least seventeen shall fall on Sunday. No deductions from wages and salaries shall be made on account of this freedom. On Sundays the transportation of ordinary freight (not fast freight) is prohibited.

(b) *Regulation of the Internal Organization of Railway Companies.*—The rights of stock companies had been left to the regulation of the cantons until the enactment of the law concerning stocks and bonds. This federal law went into effect January 1, 1883, but gave all existing and validly constituted companies until January 1, 1888, to adjust their

statutes to the provisions of the new law. For the railway companies this interval had been shortened to January 1, 1885, by the accounting law, to be discussed below. In several other points the accounting law broke through the new law on stocks to the disadvantage of the railway companies. It prescribed more detailed provisions concerning the balances of railway companies than existed for other stock companies, and deviated from the provisions of the law concerning stocks and bonds by giving permanently to the federation and cantons the rights relating to voting and administration, which had been temporarily vested in them and only in regard to certain railway companies. The law gave the federal authorities power of their own accord to regulate similar rights in the future.

As has already been mentioned, the federation later on, when it had become chief stockholder of the Jura-Simplon Railroad, utilized these provisions in order to free itself from those terms of the law concerning stocks and bonds by which the number of votes of a single shareholder is limited to one-fifth of the whole number represented in the general meeting.

Of especial significance for the law of railway joint stock companies is the federal act concerning the Right of Voting of Stockholders of Railway Companies and the Participation of the State in the Administration of the Same (1895). This act created for companies operating more than 100 kilometres of railways is a most singular corporation law. The right to vote at general meetings is restricted to holders of non-transferable bonds which have been recorded in the stock-book in the name of the holder for at least six months, or since the organization of the company. Transferable bonds shall not be converted into non-transferable ones. A single shareholder can be represented in the general meeting by one proxy only. Borrowing and lending of shares for purposes of voting is forbidden and punishable. At least four-fifths of the administrative personnel must be composed

of Swiss citizens residing in Switzerland. When an administration is composed of several members, the Bundesrat and each of the cantons into whose territory the railway extends, is entitled to elect from one to four members. The cantonal representatives shall, at the most, constitute one-third, and those of the federation and cantons together shall not exceed two-fifths of the total membership of the administration. They have the rights of members elected by the general meeting, but need not be shareholders. The organs (directorates) for the transaction of business shall be elected by the administrative councils, but shall not be members of the latter at the same time. The Bundesrat shall approve the resolutions of the general assembly, which approval may be refused when important public interests are prejudiced. For the same reason it may suspend resolutions of the administrative councils, etc. Another part of the law deals with penalties following its violation.

Only the first part of the law concerned the interests of the shareholders, and this part of the law was not very successful. The rest of the act was intended to insure to the state the greatest possible influence over the administration of the railways. Hence this act falls into the group of laws which aimed to accomplish:

(c) *The Preservation of the Interests of the State in Railway Affairs.*—The interests of the state were chiefly those of a possible future owner of the railways. We have already shown that the idea of a state system, even after the defeat which this notion suffered in 1852, was in nowise given up. The federal government adhered to it with tenacity and this idea continually infused a certain feeling of freedom of disposition in railway matters which may be compared with the feelings of a landlord who intends himself to cultivate his farm after the lease expires.

The accounting laws of 1883 and 1896 indicate this. These laws, however, have for their foundation and postulate the repurchase provisions of the charters, and it will be

desirable to consider those provisions before discussing the laws in question.

Repurchase Provisions of Charters after the Year 1872.

The situation prior to the year 1872 has been described above, and we have already stated that it was not the intention of the Bundesrat to incorporate in the normal charter repurchase provisions which should differ from those hitherto in force. Much more than this was required to adjust them to the provisions of existing charters. The councils sympathized with this view and accepted, with few changes, the wording of the repurchase clauses of the normal concession (Art. 27) proposed by the Bundesrat. This article as accepted reads: In the execution of the repurchase powers of the federation, or—if the federation should not exercise the powers—of the participating cantons, the following provisions shall apply:

(a) Repurchase can at the earliest be undertaken on May 1, 1893, and thereafter at any time. The company shall receive three years' notice of the resolution to repurchase before the same can take effect.

(b) Through such repurchase the government becomes owner of the road with all its equipment and other appurtenances. Nevertheless, the rights of third persons toward pension and aids funds remain intact. At whatever time repurchase may be effected, the road and all its appliances shall be ceded to the federation, or to the canton, in an entirely satisfactory condition. Should these conditions not be complied with and should the expenditure of the renewal and reserve funds not be sufficient for this purpose, then a proportionate sum is to be deducted from the repurchase price.

(c) The amount of the indemnity for repurchase, in so far as the latter becomes lawful before May 1, 1918, shall equal twenty-five times the average annual net profits for the ten years immediately preceding the date on which the

company had been notified of the intention to repurchase; if repurchase takes place between May 1, 1918 and May 1, 1933, twenty-two and a half times this average; between May 1, 1933 and the expiration of the charter, twenty times the above described average; but in no case shall the indemnity be less than the certified amount of the original investment less the amount of the renewal and reserve funds.

In the determination of the original costs and of the net profits, any business interests associated solely with the railway enterprise ceded to the State by this act may be considered in making the calculations.

(*d*) The net profits shall consist of the excess of the operating receipts over operating expenses, including in the latter all sums that have been transferred to other accounts or that have been incorporated in a reserve fund.

(*e*) In case of repurchase at the expiration of the charter, the government may choose between paying the amount of the original investment in construction and equipment or a sum estimated by the federal court.

(*f*) Disagreements which may arise over repurchase and the questions connected therewith shall lie within the jurisdiction of the federal court.

In fixing the net profits the Bundesrat had proposed to include interest on indebtedness among expenses. The federal assembly struck it out. Provision *e* was first inserted by the federal assembly.

The provisions according to which the minimum amount of the indemnity should at least equal original costs was frequently omitted in later charters. In other respects the repurchase provisions of all charters granted from the year 1872 on were in their essentials like those of the normal concession.

The systems of the larger Swiss railway companies have, without exception, been built on the basis of older concessions, and not on the basis of a single charter. Charters

were granted at different times for individual sections of the road, consequently there are varying repurchase limits. Only the Gotthard Railroad has but one repurchase limit. Notice of the intention to repurchase may be given to it on May 1, 1904, and on May 1, 1909, the same may be executed.

By voluntary agreement with the other large companies the Bundesrat sought, at a convenient time, to bring about a consolidation of the different charters and a unification of the repurchase limits. It was successful with the Swiss Central, the United Swiss, and the Jura-Simplon railways which, with their dependent lines, may be repurchased on May 1, 1903. With the Northeast Railroad this has not, thus far, been possible, hence it has secondary lines which may be repurchased on the above date, and others whose acquisition will not be possible till later.

The clause according to which the decision of repurchase disputes shall, in all future charters, no longer be entrusted to a court of arbitration, but to the federal court, is much newer than the other clauses.

The repurchase provisions of the normal concession could be regarded only as interpretative material for the explanation of the charters of the older lines, but because of the well-known intention of the Bundesrat to model the older concessions closely after the normal concession, those provisions were of paramount importance. They also help in the interpretation of the existing repurchase provisions which have by no means been drawn up with a doubt-excluding clearness.

The price to be paid by the state is to be calculated on the basis of the net profits, or it is to be made equal to the original capital stock, *i. e.*, original costs, etc. Both are notions whose contents can by no means be considered fixed beyond dispute without further definition. That the road and all its appliances shall be transferred in a thoroughly satisfactory condition are likewise demands which require judicial definition.

In drawing up the charters and resolutions of approval, these ambiguities had manifestly not been much noticed. Not until it was proposed to put the repurchase provisions into operation did men become conscious of the difficulties which obstructed an accurate determination of the repurchase price, and then only little by little.

This happened for the first time in 1883. At this time, while the Bundesrat was giving the question of the repurchase of a large number of Swiss railways a somewhat extensive investigation, it made the discovery that the capital stock of the various roads was estimated too high and that the average dividends paid by them during the last ten years appeared excessive in comparison with the actual receipts, and that a materially smaller income would have to be looked for in the future. Furthermore, the repurchase procedures prescribed by the charters and the lack of legal provisions for the determination of the repurchase sum, left every guaranty wanting that the purchase price would correspond with the actual value and income.

For this reason the Bundesrat could not advise the federal assembly to give the companies notice of repurchase on May 1, 1883. It however felt itself under obligations to remove the difficulties which it had discovered before the expiration of the next repurchase period; and since repurchase on the basis of capital stock should have taken place in 1883 for nearly all railways, it proposed a law to enable the government to determine accurately the capital stock and to reduce it as much as possible.

Laws Preparatory to Repurchase.

The Accounting Law of 1883.—The federal law concerning the Business of Accounts of Railway Companies of December 21, 1884, is known briefly as the "Accounting Law." Besides being intended to facilitate concessional repurchases in the future, a purpose which is clearly reflected in the origin of the law and in the message that accompanied it

when it was submitted to the councils, the law also aimed at an improvement in the accounting system. The effect of the law has been to place the railways on a sounder financial basis.

The law provides that only the actual costs of construction or acquisition shall be placed among the assets of the balance sheet. When a road is purchased by another company the purchase price shall not exceed the value of the new balance, even though the cost of construction was greater; in no case shall the amount of the old balance be exceeded. After a road has been opened to traffic the cost of completion, extension, or of additional equipment shall be counted as assets only when these expenses secure an extension or an essential improvement of the existing plant in the interests of traffic. The costs of maintenance and replacement shall be paid out of annual revenues or out of funds set apart for this purpose. However, with the consent of the Bundesrat these costs may be distributed over several years, whenever they are of an exceptional character. Sums which have been incorrectly entered in the construction account and all items removable from the balance, are to be replaced from the annual surplus revenues in accordance with a sinking fund plan approved by the Bundesrat.

In case the general meeting of the company refuses to recognize the changes in the accounts and balance requested by the Bundesrat, the latter may appeal to the federal court, within thirty days. Every payment of dividends shall be deferred until such disputes have been settled, a provision which has been somewhat moderated in practice by retaining only a sum sufficient to cover the difference. As a transitionary regulation the right to refer the fixing of the capital stock in cases of repurchase to a court of arbitration was granted.

Among the items removable from the assets of the balance, and which were to be replaced from a sinking fund

formed out of the annual surplus revenues, the Bundesrat included, first of all, the costs of incorporation, organization and administration, losses sustained in calling in stocks and bonds quoted at a premium, expenses involved in rebuilding and changing tracks and operating appliances, in so far as no real increase in the value of the plant has been brought about through these outlays. The Bundesrat had estimated the amount which, in consequence of this law, was to be transferred from the building account of the five large Swiss railways in question at about seventy and a half millions of francs. The final settlement of this balance amounted to over one hundred and twelve millions of francs, and the Swiss railways have since been amortizing that sum.

By the time the next term of notification for repurchase had arrived conditions had materially changed. The situation of the large Swiss railway companies had been strengthened, traffic was growing, and revenues were increasing steadily in spite of the rigid accounting regulations. The Bundesrat foresaw that it would very probably be obliged to pay to the majority of the railways, in case of repurchase in 1903, twenty-five times the net profits for the ten years immediately preceding the notification of repurchase, and not the amount of their capital stock, which would have been paid had notice been given in 1883.

The Accounting Law of 1896.—The law of 1883 had not sufficiently provided for determining net profits. This defect, as well as a series of other hindrances which stood in the way of a concessional repurchase, the Bundesrat endeavored to remove through a new law—the Accounting Law of 1896. The Bundesrat asserted that the first thing to be done was to require the companies to hand in accurate statements and vouchers which would supply the government with the material necessary for the correct determination of the repurchase price before acting upon the resolution to repurchase. In reality, however, it was

attempted to insert in the law certain provisions which would materially influence the amount of the repurchase price, and that not to the disadvantage of the state.

The main contents of the law are the following: The accounts and balances of the railway companies, contained in forms provided by the Bundesrat, shall be submitted to that body for examination and approval before the same are presented to the general meeting of stockholders. At the same time special vouchers relating to net profits and capital stock shall be handed in; for the examination of which the Bundesrat shall have access to the books of the company. It may also demand a separate statement for each line owned by a company, and in case any company fails to make such statement the Bundesrat may, on its own motion, order a consolidation of the various charters and fix May 1, 1903, as the common date of repurchase. After the opening of traffic only such outlays for completing and extending the road or for purchasing additional appliances through which an increase or material improvement of traffic is brought about shall be entered upon the building account. Expenses for improving or strengthening the permanent way shall not be carried on the construction account. The value of removed or ruined structures shall be transferred from the construction account. Plans and estimates of intended purchases of appliances, whose entry on the construction account is permissible after the opening of the road, shall first be laid before the Bundesrat. The construction account shall especially not be burdened with the costs of incorporation and of raising the necessary capital; losses due to a fall in the market value of stocks and bonds; subsidies granted to other railways, highways, bridges and the like which remain property of third persons, even when the railway bears their entire cost; the cost of structures erected by subventions *à fonds perdu*; nor the cost of organizing and directing the operation of the road. The maintenance of existing structures and appliances shall be accounted as

running expenses. Interest on indebtedness and contributions to the renewal and other statutory and regulative funds shall be entered under expenses of the profits and loss account, even when revenues are not adequate to defray them. For all structures and appliances subject to material depreciation, such as track, rolling stock, tools and implements, a renewal fund shall be established which is at all times to correspond to the full amount of such depreciation. In consultation with the companies the Bundesrat shall annually determine the amount of the contribution to this fund, reserving to the companies the right of appeal to the federal court. The difference between the renewal fund and the depreciated value of the road, as well as all items which cannot be carried on the construction account, shall for the time being be entered among the assets and sunk by annual contributions from current revenues. The Bundesrat is final authority as to the time and amounts in which these sums shall be replaced. Dividends cannot be paid until the accounts have been approved. To what extent these provisions relating to the construction account and contributions to the renewal fund are calculated to affect the repurchase price itself the future will decide. The attempt to employ them in such a direction does not appear to be wanting.

In case the Bundesrat objects to the annual accounts or balances, the companies may appeal to the federal court within thirty days. Dividends cannot be paid until after the accounts have been approved.

One part of the law stipulates that after the law has gone into effect the Bundesrat shall, by amicable negotiations with the companies, determine the amounts which may be carried on the construction account as expended during the expired period of time as well as the sums that may be credited to the renewal fund; and further, the law stipulates that the Bundesrat shall secure an agreement as to the principles according to which the concessional

calculations of net profits and capital stock shall be made. Should such an agreement not be possible, then the Bundesrat shall settle the question. The companies have the right of recourse to the federal court.

Finally, the federal court is declared to be ultimate authority in all questions of dispute which by the charters may be referred to a court of arbitration. This provision drew upon the law the sharp criticism that it prejudiced the charter rights of stockholders in an impermissible manner.

This law went into effect November 1, 1896, and was the last one passed as a preparation for the repurchase act itself. In enacting the Accounting Law it is possible that the intention was to create a definite basis for the determination of the repurchase price of the five large roads, and to undertake these calculations before the close of the next period of notice which, for a number of important lines, was May 1, 1898. However, this object was not attained.

After the Accounting Law had gone into effect on November 1, 1896, the Bundesrat allowed nearly a whole year to pass before taking up the negotiations with the railway companies provided for by the law relating to the concessional determination of the net profits and the capital stock. During these negotiations irreconcilable differences of opinion were brought to light, and nothing was decided. Consequently after the repurchase law had been accepted by both councils, but before it had been voted on by the people, the Bundesrat, on its own motion, established the principles by which the net profits and capital stock were to be fixed. The railway companies hereupon had recourse to their right of appeal to the federal court. The opinion on this appeal was handed down toward the close of the year 1898, and was favorable to the State.

It is fair to assume that since the principles for the determination of the net profits and capital stock have now been decided upon, the Bundesrat will make another

attempt to reach an understanding with the companies on the terms of repurchase. In the proceedings of 1898 the vital problem was the definition of the terms net profits and capital stock, and the treatment of contributions to the renewal fund, while the equally indefinite charter provisions concerning appurtenances and the satisfactory condition at the time of transfer were not given much attention.

*The Federal Law of October 15, 1897, Concerning
Repurchase of Railways.*

The Acquisition of the Railways and their Legal Status.—The federal law,* together with an elaborate message, was submitted to the federal assembly on March 25, 1897, and during the course of that year was accepted by both the councils. The councils made several changes in the bill, especially in the part relating to the future organization of the railways. As was to be expected, the referendum was resorted to within the legal time limits. The vote was taken on February 20, 1898, and a heavy majority secured in favor of the law.

The law contains the necessary provisions concerning the acquisition and operation of railways by the federation and the organization of the administration of the Swiss federal roads. It first establishes the general principle that the Swiss railways, which, because of their economic or political importance, serve the interests of the *Eidgenossenschaft* or of a major part of the same, and the acquisition of which can be achieved without disproportionate sacrifices, shall be purchased by the federation and operated on its account under the name of the "Swiss Federal Railways." In addition it names those lines which are to be purchased at the expiration of the next time limit. These, the five trunk lines, are the Central, purchasable in 1903, Jura-Simplon,

* Concerning the Acquisition and Operation of Railways on the Account of the Federation and the Organization of the Administration of the Swiss Federal Railways, of October 15, 1897.

1903, the Northeast (the majority of its lines), 1903, the United Swiss, 1903, and the Gotthard Railroad, 1909. These companies operated 2748 km. in 1897. The Bundesrat is, moreover, empowered, with the consent of the federal assembly, to purchase such other of the then existing roads as may conform to the above conditions, or it may undertake simply the operation of secondary lines. The acquisition of the railways shall take place by means of repurchase on the basis of the "federal law and charters," but a free-handed purchase, subject to the approval of the federal assembly, shall not be excluded, in which case the same principles shall prevail in fixing the repurchase price.

The funds necessary for repurchase shall be raised by the emission of obligations or coupon bonds. This indebtedness shall be canceled within sixty years, at the farthest, by means of a fixed plan of amortization. By voluntary agreement with the owners, and by complying with the above amortization plan some other means of payment may be chosen. It is probable that in this connection an assumption of the bonded indebtedness of the road was kept in view either as part or full payment, although the Bundesrat does not recognize it as a *duty* to assume the debts of the railway companies.

The provision relating to the amortization of the entire capital necessary for the purchase and operation of the railways, within sixty years, which has been pronounced possible by the Bundesrat, won the measure many friends. It may even be said that among the masses of the people this was the most decisive factor in their acceptance of the law. It is also absolutely indisputable that it will be an enormous economic advantage for Switzerland to be in possession of a great network of railways, free from indebtedness, by the middle of the next century. In view of these enticing possibilities and the assurances of the federal authorities, doubts as to the realization of this beautiful thought, frequently uttered by the experts, were passed over rather

lightly. Article 8 of the law prescribes that the complete separation of the accounts of the federal railways from those of the federation is of great importance. The income of the federal railways shall never be employed in meeting other expenses of the state, but shall be used first of all for the payment of interest and the amortization of the indebtedness of the railways. Whatever remains shall be divided as follows: 20 per cent is to be paid into a reserve fund to be administered by the state and kept distinct from other assets until the same shall amount to 50,000,000 francs; the other 80 per cent shall be employed in the interests of the federal railroads, to the improvement of the traffic, reduction of rates, etc.

These provisions are intended to make it impossible to operate the federal railways for fiscal purposes. The railroads are to serve exclusively the general interests of traffic.

Organization of the Administration of the Federal Railways.—What now is the nature of the administration to which the performance of the momentous task of directing the future federal railways is to be entrusted? It is not, and could not be, expected to be very simple. There were difficulties to be overcome which were by no means trivial, because of the manifold political interests, wishes, apprehensions, which came in collision with the desires of economic associations and the principles of a simple, expeditious administrative organization.

One of the foremost demands was to make the railway administration as independent as possible of the other parts of federal administration in order thereby to protect it, at the outset, as much as possible from every political influence. This demand was met by the provision of the law that "the administration of the federal railways shall form a special part of the federal administration."

The deliberations of the federal assembly led more and more to a decentralization of the organization of the

railway administration, in order to insure to the cantons and various country districts some influence upon it, and to promote the adoption of the law by yielding wherever possible.

The entire network of Swiss federal railways is divided into five circuits, whose managements have their seats in Lausanne, Basel, Zurich, St. Gallen and Luzern, corresponding to the present railway administrative centres. At the head of each circuit there is a circuit directory composed of three members. Above these bodies there is a general directory of five or seven members with its seat in Bern. The members of both the circuit directory and of the general directory are elected by the Bundesrat on the voluntary nomination of the administrative council. This body also names the president and vice-president of the directory.

The scope of the business of the *circuit directory* embraces the current business of the respective circuit, namely: (1) the administrative and judicial representation of the railway administration in all those affairs over which the circuit directory has jurisdiction; (2) the drafting of estimates falling within its business scope; (3) the maintenance of the road and appliances, including the superstructure and the management of the telegraph; (4) the management of repairs and other changes in the construction of the operated network, in so far as these have not been separately provided for by the general directory; and the making of contracts, connected with these matters relating to the acquisition of land, building and delivery when the sum involved does not exceed 100,000 francs; (5) drawing up plans for the structures mentioned in 4, above, in so far as this has not been reserved by the general directory; (6) to keep watch over the road and the railway police; (7) the necessary precautions for the protection of the railway administration against encroachments upon its property rights and against annoyances of possession; (8) the construction of

time tables for the network operated by it, with due regard for the norms set up by the administrative council, and other regulations of the general directory; (9) motive power department; (10) train service; (11) shipping, including warehouse management; (12) operation of machine shops; (13) chief administration of magazines and materials, subject to the powers of the general directory; (14) the management of carting [camionnage] and making contracts relating thereto with undertakers; (15) the making of building and delivery contracts not reserved to the general directory; (16) the adjustment of claims of the internal traffic of the federal railways arising from an incorrect application of rates or incorrect routing, from losses or damages of goods, from delays in passenger and freight traffic, in so far as this cannot be assigned to station chiefs or other employes; further, taking up and transmitting to the general directory similar claims arising out of traffic with other railways; (17) the management of indemnity claims arising from killing and injuring persons; (18) the leasing and renting of disposable immobilia and of station restaurants; (19) the sale of dispensable immobilia; (20) matters pertaining to taxes; (21) rendering opinions on questions submitted to it by the general directory, especially on rates and on regulating the relations with union depots and other traffic regulations with connecting roads; (22) giving audience to authorities and private persons concerning affairs which fall within the business scope of the general directory and transmitting the desires of complainants to the latter with an opinion. To this we must add the election of its personnel, with the exception of chiefs of divisions.

The approval of the *general directory* is required for: (1) agreements concerning the disposition of claims enumerated in 17 above, when any one allowance exceeds 20,000 francs; (2) contracts relating to carting [see 14 above]; (3) contracts relating to the sale of real estate [Art. 35, 19], with a

reservation as to the competence of the administrative council; (4) contracts concerning construction, land purchase and delivery when the amount involved exceeds 100,000 francs.

The circuit directories meet in conference with the general directory at least three times each year, but possess no administrative powers. They participate in the sessions of circuit railway councils and through their president also in those of the administrative council, with deliberative powers.

In so far as the present law makes no exceptions and restrictions, excepting the powers assigned to the administrative council, the entire business management devolves upon the general directory.

The *general directory* has the following powers and duties: (1) the administrative and judicial representation of the railway administrations with the foreign authorities, in so far as the same has not been vested in the circuit directory [1 above]; (2) the nomination of all officials and employes immediately subordinate to it, and on voluntary nomination of the circuit directory of all superintendents of crews in the circuit; (3) establishing norms for the wages of officials and employes appointed by the circuit and general directories; (4) fixing salaries within the scope of the remuneration law of the budget of officials and employes appointed by it; (5) drafting the annual budget; (6) drawing up the annual account; (7) preparation of the annual report on the management of the business; (8) preparation of all other business to be managed by the administrative council and not already mentioned; (9) carrying out resolutions of the administrative council; (10) establishing the necessary regulations, instructions and rules for the various branches of the service; (11) rates; (12) the control of operating receipts [control of operation]; (13) the settlement of claims arising from joint traffic due to the application of improper rates and to incorrect routing; further, claims from losses or damage of goods or delays in passenger and freight service, in

so far as the same have not been by executive ordinances of the Bundesrat assigned for adjudication to the circuit directory or other offices; (14) the construction of time tables, including the care for their proper application to meet the requirements laid down by the circuit directory for through traffic; (15) the central car bureau; (16) the construction of new buildings and making repairs, in so far as these have not been left to the circuit directory; (17) making agreements with other transportation agents relating to joint traffic or the regulation of competition; (18) making contracts with other railway companies concerning the construction and common use of depots, stations, tracks and appliances; (19) making contracts relating to the acquisition of real estate necessary for constructions conducted by the general directory; further, all contracts relating to the acquisition of real estate for other building purposes; (20) superintending the personnel of the pension, aids and sick funds bureaus, with the co-operation of the latter; (21) making, subject to the power of the administrative council, building and delivery contracts for all structures executed by the general directory, as well as for the delivery of material for the superstructure, for the purchase of fuel and oil for the machine service and for new rolling stock; (22) supervision of the business management of the circuit directory, and the issuing of instructions to the same in order to bring about the desirable unity and harmony in the administration; (23) the adoption of resolutions on matters reserved for its approval [compare 4, 14, 17 and 19 above]. It apportions business among its members according to departments and must submit quarterly to the administrative council summaries of the operating accounts of the railways.

By the side of these executive organs of the administration stand the circuit railway councils and the administrative council, whose functions are more of a deliberative nature. The organization and powers of these councils enable political and economic interests to assert themselves in the

administration in such a manner as to harmonize deliberative and executive functions.

In every circuit there is a *circuit railway council*, composed of fifteen to twenty members, of whom the Bundesrat elects four and the cantons eleven to sixteen. They meet regularly once every quarter. Their business scope embraces: (1) the election from their own members of a president and vice-president, who hold office for one official period; (2) the election of one member of the administrative council; (3) rendering opinions on all questions concerning railway affairs [especially time tables and rates] for transmission to the authorities who have jurisdiction in such matters. These opinions may be requested by (*a*) the federal authorities, (*b*) a cantonal government, (*c*) the administrative council, (*a*) the representatives of agricultural, industrial and mercantile organizations or of other economic unions, (*e*) one of their own members; (4) the approval of annual budgets and accounts worked out by the circuit directory for transmission to the general directory, and of reports relating to the same; (5) the decision upon all credits not provided for in the budget, or those which exceed the amounts allowed by the administrative council, so long as their total does not exceed the budget by more than 100,000 francs; (6) approval of the quarterly report of the circuit directories concerning the business under their charge. Members draw only mileage and per diem rates.

The *administrative council* is composed of fifty-five members, of whom twenty-five are elected by the Bundesrat, twenty-five by the cantons and five by the circuit railway councils from their own numbers. Of those elected by the Bundesrat not more than nine shall at the same time be members of the national council or of the council of states. The Bundesrat shall take care—so says the law—that in these elections agriculture, trade and industry shall be properly represented. Other groups of interests, such as the employes of the federal railways, received in the discussions

verbal promises from the Bundesrat of representation in the administrative council. The administrative council meets regularly every quarter. Its members likewise receive only mileage and per diem pay.

The business scope of the *administrative council* embraces: (1) supervision of the entire administration; (2) drawing up the annual budget for transmission to the Bundesrat; (3) the examination of annual accounts and reports on the management of the business prepared by the general directory for transmission to the Bundesrat; (4) fixing the principles of rates and of freight classification, with regulative provisions falling within the scope of the law; (5) fixing norms for constructing train schedules [classification of trains, number of trains, speed, etc.]; (6) leasing railways not owned by the federation, renting its own lines to transporters and the disposition of secondary enterprises; (7) ratification of important agreements with other railway managements concerning the common use of depots, stations, tracks and those relating to joint traffic arrangements; (8) drawing up norms for grading, tracks, superstructure and rolling stock; (9) rendering decisions relating to the alignment of new routes, adopting plans of the more important depots and of the more significant repairs and rebuilding operations; (10) the approval of building and delivery contracts involving more than 500,000 francs; (11) the purchase of real estate, the acquisition of which does not result from undertaking the building of railway structures, in so far as the purchase price exceeds 200,000 francs; likewise the sale of real estate whose selling price exceeds 50,000 francs; (12) determining the organization of the railway service according to the provisions of the executive ordinance issued by the Bundesrat; (13) drafting motions for the appointment of the general and circuit directories; (14) confirmation of elections of chiefs of the divisions in the general and circuit directories; (15) fixing the remuneration of officials named in the preceding section [14]

within the limits of the law as regards remuneration and of the budget; (16) establishing the general conditions of appointment for the personnel; (17) framing statutes for the pension and aids funds; (18) examination of schemes for improvements in operation proposed by circuit railway councils; (19) rendering opinions on proposed changes in the laws and ordinances relating to federal railways; (20) rendering opinions on petitions for the building of new lines on the account of the federation.

Over and above this federal railway administration stand the federal authorities, the assembly and the Bundesrat who may exercise the following special powers in railway matters:

The Federal Assembly.—(1) Approval of the manner of making loans and of the amortization plan; (2) approval of agreements relating to the acquisition of existing railways, to undertaking the operation of secondary lines and to the admission of the federation to agreements which may have been made between primary and secondary roads; (3) legislation on the general principles of the formation of rates; (4) enacting laws relating to the acquisition or the building of railways; (5) legislation pertaining to remuneration; (6) approval of the annual budget; (7) examination and acceptance of the annual account and of the report on business management.

The Bundesrat has power over (1) the issuing of an executive ordinance for this law; (2) the election of (a) twenty-five members of the administrative council, (b) members of the general and circuit directories, (c) four members of each of the circuit directories; (3) the introduction of the following measures into the Swiss councils: (a) annual budget, annual account and business report; (b) motions relating to undertaking the operation of secondary roads and to the admission of the federation to agreements relating to contracts which may have been concluded between primary and secondary railways, (c) motions relating

to the building of new railways and to undertaking the operation of existing lines; (4) the exercise of the same powers that are vested in the Bundesrat in relation to private railways, in so far as the premises of these powers apply to federal railways; (5) the approval of the statutes governing pension and aid funds of officials and of permanent employes; (6) the issuing of the necessary regulations for the establishment of sick funds.

The Result of the Popular Vote on the Repurchase Law.

With a participation of about 550,000 or 78.6 per cent of the whole number of qualified voters, the repurchase law was adopted by a majority of over 200,000 votes.

Both as regards the percentage of voters participating and the numbers voting, there has been no more general expression of popular opinion since the adoption of the present federal constitution in 1874. In the cantons of the lowlands the interest in the question was such a lively one that the canton of Zurich, for example, shows a participation of 91 per cent, St. Gallen 83 per cent and even the mountainous cantons, in which heavy snowstorms had obstructed communications, indicate a participation of 80 per cent (Uri) and 74 per cent (Graübunden). There is no canton, indeed almost no commune, in the whole country, which did not surprise both supporters and opponents of the law by giving an unexpectedly large majority in its favor. When, on the day following the vote, the "Zürcher Post," wrote, "the most audacious optimist had not the remotest idea of the possibility of this result; we, too, anticipated only a majority of 50,000 in favor, at the most," it did not incorrectly characterize the situation before the election.

The result demonstrated that the gradual development of the idea of state railways, to which we referred above, and whose manifold elements we attempted to analyze, had been infused into all parts of the population. The idea that railways should belong to the community and should serve its

interests exclusively, had set its roots down deep and grown mightily during the storms of fifty years of exciting railway history.

It required only an external stimulus in an attractive form and a favorable conjuncture of party conditions, which are not without great significance in a democratic state with a well-developed political schooling, in order to transform the slumbering idea into an irresistible enthusiasm and to unite the more indifferent and vacillating persons with those who were convinced of the necessity of nationalization. Both circumstances combined in this case in a high degree. The political conditions were remarkably favorable to the proposed law.

As a political antagonist to the principle of the law, the federal party might have been expected to offer a united opposition, but just then this party was extraordinarily split up. The kernel of the party is the catholic, conservative party of the old *Sonderbund** cantons, Uri, Schwyz, Unterwalden, Luzern, Zug, Freiburg, Wallis, Tessin—one may call them historical federalists—cantons which are supposed to have lost more than the others through the new development of the *Eidgenossenschaft*. To these are joined the catholic conservative minorities of the central and west Swiss cantons, and also the more theoretical federalists of west Switzerland, who represent in their cantons the radical progressive party. This party has always formed the chief power of the opposition against the federal government and its legislation. This time such a coalition was impossible.

As is well known, the liberal party has been at the head of the government uninterruptedly since the reorganization of the *Eidgenossenschaft* in 1848, and it was not until 1891, when the federal councilor Welti resigned after the defeat of the Central Railroad Repurchase Act, that a representative of the conservative minority entered the Bundesrat. At that

* A league within the federation. The first *Sonderbund* was formed in 1832, and comprised the cantons of Zurich, Luzern, Bern, St. Gallen, Solothurn, Thurgau and Aargau.—*Translator*.

time its leader, Dr. Zemp, the originator of the present railway repurchase law, was elected.

But although from the economic and political point of view Switzerland developed in a striking manner in the forty-three years during which the administration of the country was exclusively in the hands of the progressive and of the central parties, the total exclusion of a very considerable minority had created a feeling of depression among wide circles, a feeling which frequently, even in case of commendable bills, gave the opposition the power necessary to bring about defeat. This factor disappeared entirely in 1891. Indeed, it was the former leader of the catholic conservative and federal party, a Swiss German, who drew up the project for nationalization and eloquently supported it on the public platform.

This made it possible for all those members of the great conservative party, whose past did not forbid every departure from the strictest federalistic principles, to approach the repurchase bill without prejudice. Especially the catholic conservative minority of the central and east Swiss cantons—Solothurn, Aargau, St. Gallen, Gräubünden—did this almost unanimously; and even in the old centres of the federal party—Unterwalden, Zug, Luzern (the home of Zemp)—their influence was undoubtedly a powerful one. The west Swiss federalists, whom we have characterized as theoretical federalists, were likewise made to waver by the fact that the organization of the future administration of the federal railways was to be made as independent as possible of the federal government, and also by the promise of the federal government to cut a tunnel through the Simplon.

In this manner the power of the historic political opposition was shattered, while another party, which had arisen in recent times as an antagonist of the federal government and of its legislative activity, the social democratic party, was not an opposing factor, because it had advocated the nationalization of the railways.

The wide field for the "real" and "impartial" consideration of the question was thus left open. It must be admitted that the conditions for repurchase were extremely favorable for a discussion of the problem on these grounds. The discussion centred upon the message of the Bundesrat accompanying the repurchase law. In this message the difficulties of concessional repurchase were overcome with almost playful ease. Starting with the proposition, which should have been the conclusion of the investigation, that the repurchase of the railways on the basis of the charters would prove to be a profitable transaction, the authors of the message succeeded in calculating a surprisingly low price for the railways on the basis of the charters themselves. With enviable optimism it was assumed that all disputes could be construed in favor of the purchaser. It was attempted to establish a series of advantages for the purchaser, which in earlier trials had not been thought of. Then, too, there was the circumstance that both in the message and in public addresses the price thus estimated was assumed to be the highest sum for the payment of which the state could be held.

On such a basis it was possible to predict an income from the operation of the federal railways, which, in addition to paying interest on the investment, was to make possible the complete maintenance of the tracks and rolling stock out of the operating receipts, the establishment of a reserve fund, the reduction and simplification of rates, extension of the railway network, and also the full amortization of the capital invested, within sixty years. Wherever doubts were raised against this they were summarily dismissed with the axiom of constantly increasing traffic, which was identified with constantly increasing net profits, as a matter of course.

When one reflects that all these direct and indirect advantages of the future railways were promised to the people by numberless, perhaps more well-meaning than well-informed, champions of the federal bill, and with much more confi-

dence and certainty—a certainty which became greater as the day of voting came nearer—than the originators of the law themselves possessed, it is easily possible to picture to one's self what the effect must have been. This, then, was another and very important reason for the acceptance of the law: the expectation of all possible improvements in traffic, besides the complete amortization of the capital stock in a relatively short time and without increased burdens on the public.

The desire for independence from foreign capital was also of great influence. A large part of the shares of Swiss railways are in the hands of foreign capitalists, and although their influence on the administration of the roads was not in itself a disturbing one, and was, besides, restricted through federal legislation, this condition was generally looked upon as undesirable. It does not reflect honor upon the Freisinnige party that it could not entirely resist the temptation to make popular this beautiful idea of independence by mixing with it a tinge of anti-semitism.

Against all these arguments little opposition was shown by the antagonists. The special knowledge required for a successful attack on the statistics upon which the friends of repurchase supported themselves, was at the disposal of those people whose close connection with the railway companies and their administrators, had imposed upon them the strictest neutrality. The interests of such persons were more or less opposed to entering into the conflict. Furthermore, these persons probably realized that it would be impossible by means of criticism directed against the law under consideration and the accompanying message to shatter the popular conviction of the necessity for nationalization.

The chosen representatives of the system of private railways waived every opportunity for public discussion just as they had done twenty years before, when, through their withdrawal from the federal assembly, they gave up the

possibility of defending the interests of the railway companies in the councils.

Whoever dared to question the danger of being dependent upon foreign capital, or who could not recognize nationalization as a proper remedy for the same, or who could even point to the services of foreign capital to Swiss railways, had to run the risk of being accused of being wanting in patriotism. Hence it was that the position of the opponents was from the first a weak one; they did not form a closely organized party; their arguments received no support from authoritative quarters and were not popular. The hopes for the future which the friends of repurchase shared so fully and so effectively, did not, in the nature of things, admit of a real discussion.

The adoption of the law concerning railway repurchase is a triumph of the idea of centralization, a triumph of the idea of state socialism, and is an expression of the self-conscious, future-enjoying and optimistic frame of mind of the Swiss people. That this mental feeling was oftentimes artificially kindled and nourished, that the means employed for this purpose were not all sincere and worthy, that the actual conditions lead the thoughtful to fear bitter disappointment in many respects should not obscure the good features of the law. Everybody should work to make the result of the vote of February 20, 1898, productive of the greatest possible good.

HANS DIETLER.

Luzern.

FRENCH RAILROADS.

The imperial government, as is well known, has long favored the amalgamation of the leading lines of railroads in this country, and is well satisfied to see them reduced to five or six companies, enjoying an immunity from that private and public competition which has often proved so fatal to railway enterprise elsewhere. But the French railways, though undoubtedly the best established, the most remunerative, and, upon the whole, perhaps the best administered in the world, have not been allowed to gain their present position and privileges without paying some equivalents. In return for its patronage and protection, the government has imposed the condition of carrying out and completing a vast number of branches, of great service and benefit to the localities through which they pass, but by no means certain to be remunerative for the amount of capital expended on them. To carry on these works, the companies have been compelled to issue their *obligations* (bonds or debentures) in a continuous stream, chiefly through the intervention of the Bank of France, which, at their request, undertook to negotiate 240,000,000 worth of their securities, making advances the meanwhile, from time to time, to the companies. The effect of this state of things has been, in the first place, to keep the public stocks at their present low figure, by daily feeding the market with the issue of these railway bonds, and in the next place, to cause the credit of the companies to become seriously affected, both by the redundancy of their paper in the market, and also by the apprehension of the public that the numerous branch lines which they are compelled to construct would tend to anything rather than to increase the dividends of the shareholders. Under these circumstances, the railway companies have been, for some time past, appealing to the administration for the modification of a contract of which they profess to find the conditions too hard for them; and an agreement for their relief appears to have been at last come to with the Minister of Public Works. The course adopted seems, in fact, to amount to a guaranty to 4fr. 68c. per cent on the part of the government. That is to say, a dividend is to be paid first at the rate of the last returns of profits per *kilometre*, and the residue is to be applied to working expenses. If there be more than sufficient for the latter, the supplies will go to increase the dividend; if less, then the government steps in to make up the deficiency to the extent of 4.68 per cent. In addition to the above arrangement, it has been decided that no more railway paper shall be negotiated daily by the Bank of France. One hundred and sixty-five millions of *obligations* have been already so issued; the remaining seventy-five millions are to be issued at once, and the money raised by public subscription, as in the case of the State loans during the war.

CINCINNATI, HAMILTON, AND DAYTON RAILROAD.

Years.	No. of passengers.	Passenger earnings.	Freight earnings.	Mails and express.	Total.
1852-53...	236,828	\$191,700 93	\$122,377 25	\$7,714 99	\$321,793 17
1853-54...	342,954	274,650 39	176,142 11	12,228 95	463,021 45
1854-55...	370,189	259,915 35	211,562 79	12,142 34	483,620 48
1855-56...	352,451	236,568 12	221,697 54	13,620 04	471,885 70
1856-57...	362,630	231,571 54	268,819 20	17,943 21	518,333 95
1857-58...	370,957	232,596 95	214,272 37	18,868 93	465,738 19

JOURNAL OF MINING, MANUFACTURES, AND ART.

ESTIMATES OF COAL AREA.

P. W. SHEAFER, Esq., Civil and Mining Engineer, of Pottsville, Pennsylvania, has presented several estimates of the area of the anthracite coal regions of Pennsylvania, together with statistics pertaining to the bituminous coal area of this country and of Europe. To this is added a few remarks upon the comparative importance of our anthracite and bituminous coal fields at present and in the future :—

ESTIMATES OF THE PENNSYLVANIA ANTHRACITE COAL FIELDS.

	Square miles.	Acres.
Mr. Packer's report to the Legislature	975	624,000
Mr. S. B. Fisher—		
1. Southern or Schuylkill Coal Field.....	119	75,950
2. Middle Coal Field, including the Mahanoy Basin, 59,450 acres	133	85,525
3. Wyoming or Northern Field.....	120	76,805
Total, according to S. B. Fisher	372	238,280
R. C. Taylor—		
1. Southern or Schuylkill Coal Field.....	164	104,960
2. Middle, containing the Mahanoy and Shamokin Coal Basin.	115	70,600
3. Wyoming or Northern Basin.....	118	75,520
Total, according to Taylor.....	397	254,080

ESTIMATE MADE FROM THE OUTLINES OF THE COAL FIELDS ON ROGERS' NEW MAP, BY P. W. SHEAFER.

1. Southern or Schuylkill Coal Fields.

	Square miles.	Acres.
East of Tamaqua.....	16	10,240
Tamaqua to Pottsville.....	36	23,040
Pottsville to fork of the Basin	55	35,200
North Fork, Lykens Valley prong.....	16	10,240
South " Dauphin "	15	9,600
North Mine Hill Range.....	8	5,120
Total Southern Field.....	146	93,440

2. Middle Coal Field.

Shamokin District	50	32,000
Mahanoy District.....	41	26,240
Beaver Meadow 2.3 square miles of mammoth bed, in all.....	6.4	4,096
Hazleton Distr't 3 " " " "	13	8,320
Big Black Creek 2.3 " " " "	13.3	8,512
Little " 0.5 " " " "	2.3	1,472
8.1 square miles of mammoth bed, total.....	126	80,640

3. Wyoming Coal Field.....

Total, as estimated from Rogers' map.....	470	300,800
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It is also interesting to consider the relative areas in the various coal fields which are drained by the several great water courses which form the outlets to the Atlantic seaboard. The course of trade has, however, diverted the product of certain portions of the coal fields from the natural channels; hence, two systems of drainage may be taken into account—1st. *The natural drainage of the*

trying to obtain a virtual protectorate over Morocco. What I do blame her for is her inability to recognise that it is not in her power to upset the Treaty of Algeciras, and that this being so, the continuance of her occupation constitutes an obstacle to any genuine pacification of Morocco.

An early settlement of the succession to the throne, or, in other words, the recognition of Mulai Hafid as the lawful Sovereign of Morocco, is required in order to remove not only an obstacle to the pacification of the Moorish State, but a possible danger to the peace of Europe. Under these circumstances there is no inconsistency between the German Emperor's expression of his confidence in, and his desire for, the maintenance of European peace, and the subsequent declaration of the German Government that the continuance of the French occupation is neither in the interest of Morocco nor of European peace. When this declaration was made the Parisian press was well-nigh unanimous in declaring that France would never submit to dictation on the part of Germany. But as soon as it appeared that Germany meant her declaration to be taken seriously the French Germanophobe press discovered that no dictation was involved in the Imperial declaration, but that the only criticism to which it was liable was a want of tact on the part of its author, and that lack of tact was not a matter concerning which France need take umbrage.

An even more irrational outcry was raised in France and repeated in England about the recent visit of the German Consul-General to Fez as a breach of good faith on the part of Germany. All that is known about the visit in question is that Dr. Vassel made a brief journey from Tangiers to Fez. There is no evidence whatever to show that he was sent on a political mission to Mulai Hafid, or that he had any interview with the *de facto* Sultan of Morocco. Every other European Power would have had an equal right with Germany to send its representative to Fez if it had seen cause to do so. Dr. Vassel's own statement is that he went to Fez in order to protect the interests of certain German subjects residing in the capital of Morocco. If this statement is true he simply fulfilled one of the elementary duties incumbent on the representative of every European Power, with the exception of our own. In the British Foreign Office every representative of England abroad is prohibited by an unwritten law from using his influence to obtain concessions for his own countrymen, or to exert his authority to secure any British concessionaires in the event of their rights being disregarded by the Government to which he is accredited. In such matters the policy of every Continental and Trans-Atlantic Power is diametrically opposed to that of England.

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Which of these two policies is right is a question beyond the scope of this article. All I need say now is that every British merchant or capitalist or contractor who desires to obtain concessions in foreign countries is hopelessly handicapped by the knowledge that he can expect no support from the representatives of Great Britain, while the subjects of every other powerful country can rely upon the active and cordial support of their representatives in any reasonable demand either for the granting of concessions or for securing the fulfilment of the concessions on which they have embarked their money, their time, and their energy.

THE HEDJAS RAILWAY.

It has always struck me as curious how little attention is attracted in England to great enterprises outside the bounds of the four seas whose success or failure must produce immense effect on the commerce of the world. Great Britain is out and away the greatest commercial Power in the globe, and as any serious diminution of our world-wide trade might prove fatal to the prosperity, not only of the United Kingdom but of the British Empire, it seems unintelligible at first sight that our nation, as a body, should have paid so little attention to a variety of enterprises which have changed, or may change, the trade relations existing between England and her rivals in the struggle for commercial supremacy. I am told by critics, for the most part of English birth and race, that our national defect is a lack of imagination. I do not share this view myself. I am inclined to assert that it is the lack of imagination which has proved the salvation of our country. I have long thought that the wisest and the finest of Mr. Gladstone's recorded utterances is the one in which he described the British Empire as a blind Atlas staggering on beneath the weight of the world. It was Atlas's blindness which has saved us. If our world-carrier had had his sight restored and could have realised the pitfalls, precipices, and parapets which he would have to encounter every step he took, he would have refused to proceed further.

Happily or unhappily, as the future must decide, our lack of imagination has had the same effect on our progress towards the fulfilment of our Imperial mission as the loss of sight had on the Atlas imagined by Mr. Gladstone. Hardly seeing before our noses, we as a nation have stumbled on step by step till we have well-nigh reached the goal of our Imperial progress. We shall pull through somehow or other is the sentiment which has hitherto animated the British mind in all the countless difficulties we have had to surmount. We, as a nation, have trusted to British pluck and luck, and this trust so far has always been justified by the result.

We never troubled ourselves as a nation about the construction of the Siberia railway, the Suez or the Kiel Canals till they were constructed. We pay no attention to the progress of the Panama Canal; yet if it should prove successful it will give the United States absolute control of the sea-trade route between the Atlantic and the Pacific Oceans. We find out with surprise that Turkey has in the course of five years constructed, almost without the knowledge of the British public, a railway which may conceivably render Jeddah, instead of Port Said or Suez, the port of departure and arrival for the passenger traffic between Europe and British India, and we still console ourselves by repeating mentally we "shall pull through somehow or other."

What renders this indifference more astonishing is the fact that only two years ago the construction of the Damascus-Medina railway gave rise to a scare which for a time disturbed the tranquillity of the Foreign Office and its representatives abroad. When the line had got as far as the Sinai desert the Turkish contractors put up two pillars upon territory which Egypt asserted was within Egyptian territory. As there never had been any formal delimitation of the frontier showing where Turkey ended and where Egypt begun, and as the desert was occupied by nomad tribes who shifted their tents from one well to another, and who practically paid no tribute to either the Sultan or the Khedive except on the rare occasions when their encampments were raided either by Turkish or Egyptian troops, it was impossible to ascertain where the pillars, raised to mark the frontier, ought by rights to have been placed. The Egyptians attached no value to the Sinai desert from which they derived neither profit nor glory, and would have probably been content to cede it to Turkey for a very moderate consideration.

Egypt, however, especially of late, has become the chosen home of idle rumours, and some wiseacre started the ingenious theory that Turkey, acting at the instigation of Germany, was going to divert the Damascus-Medina line so as to bring it into close proximity to the eastern bank of the Suez Canal, and thus enable a Turkish army, commanded by German officers, to cross the Canal whenever they wished to invade the Delta. The idea was rank absurdity, but in those days no charge insinuated against Germany was too absurd to meet with credence. Moreover, it had long been an article of faith at the British Agency that the Egyptians regarded any encroachment upon Egypt on the part of Turkey as an insult to Egypt, and therefore our then Consul-General conceived it to be a high stroke of State policy for England to come forward as the champion of Egyptian rights in the desert of Sinai. Special missions were sent out from Cairo to study the frontier question, while the Sultan and

his Ministers were given to understand that any attempt to encroach upon Egyptian territory would meet with distinct opposition on the part of the British Government. Instead, however, of the Egyptians being impressed with our vindication of Egyptian independence, the British Agency learnt with dismay that if the Turkish troops had carried out the intention ascribed to them and had crossed the Suez Canal, they would have been welcomed by the great mass of the population of Lower Egypt. Happily no opportunity presented itself for proving whether a Turkish invasion of Egyptian territory would have been greeted with indignation or enthusiasm. The Sultan was only bent upon completing his grand conception of a railway, which was ultimately to place the whole of the Moslem world in direct and easy communication with the sacred places of Islam, and had no motive for picking a quarrel with England in Egypt. So the obnoxious pillars which, according to our British contention, cut off a narrow strip of waterless desert from the vassal State, were replaced in their former positions, and England was entitled to claim that she had won a diplomatic victory.

It seems extremely doubtful whether the Sultan ever contemplated bringing the Damascus-Medina line to any point within easy marching distance of the Suez Canal. To have done so would have necessitated, even if England had offered no objection, a prolongation of the railway dipping down southwards into the Sinai desert without rhyme or reason and then returning northwards so as to avoid the bay of Akaba. We now know what our British authorities in Egypt never seem to have realised before, that the Hedjas railway was constructed by the Sultan at his own cost or out of moneys which came into his hands as the absolute ruler of Egypt, and was therefore planned and constructed with as much economy as was consistent with efficiency.

How far it was constructed with forced labour is a matter on which I can express no opinion, having no knowledge whatever. I should say it was well-nigh certain the workmen were paid, if at all, in the most niggardly and irregular fashion, but it is most difficult to over-estimate the sacrifices that Mahometans will make in order to promote the interests of Islam; and it is quite possible, if not probable, that Abdul Hamid, the object of Mr. Gladstone's vituperation, may have inspired his fellow-believers with the idea that the construction of a railway to Medina and Mecca was a work which would lead to the spread of Islam and to the glorification of Allah and his chosen prophet. Whatever may be thought of the theological advantages secured by the Hedjas railway, it is impossible to dispute its material advantages. The line in question, when carried on as it infallibly will be to Mecca, will practically command the custom of all Mahometan communities in Asia

Minor, in North Africa, in Russia, in Bosnia and Herzgovina, in the Balkan Peninsula, in the Soudan, in the Holy Land and even in Egypt.

If there is one thing besides the faith of Islam upon which Mussulmen of all countries are agreed, it is the dislike of travelling by sea, and it is as certain, as any future event can be, that whenever there is communication between the sacred places and the Mahometan countries by railways, the sea routes will be driven out of the field. I could never realise for myself what the tangible advantages of visiting the holy places were to the followers of the Prophet, beyond the privilege of wearing a green turban and thus letting everybody know that you had seen the Kaaba, an achievement which both my friends, Sir Richard Burton and Mr. Giffard Palgrave, asserted they had done, but which they each denied that the other had accomplished. In some vague way all Mussulmen seem to be of opinion that if they die after worshipping at Mecca and Medina they will be under the special protection of the prophet of the one God, and that to secure this protection they are willing to incur any amount of discomfort, labour, risk and expenditure which may be necessary to secure this hypothetical object.

I should be the last to assert that the pilgrimages to Mecca are not the genuine expression of an honest belief; and if Turks, Arabs, Bedouins and Egyptians swarm year after year in increasing numbers to the sacred shrines of Islam, I can only congratulate them on having now to discharge their duty to their creed at less expense, less weariness and less risk than they have been able to do before "Abdul the damned"—to quote Mr. Watson the poet—undertook to construct a railway at his own cost and risk to facilitate the one heart desire of every one of his fellow-believers to worship before his death at the holy places of Islam. I expect that before long the steamers which ply between Suez and Jeddah will cease to pay their expenses; that the sacred carpet which is despatched yearly from Cairo to Mecca will be forwarded as a railway parcel; and that the ceremonies of the departure and return of the holy carpet, which have hitherto formed the delight of Cook's tourists and of the Cairo populace, will have become as obsolete as the game of karagouss which I have often seen played upon what is now the European quarter, but what was then a tract of desert sand.

PROGRESS OF THE TURKISH REVOLUTION.

I confess that I have not hitherto given the Young Turkish party full credit for the moderation and good sense they have displayed since the *coup d'état*, which caused Abdul Hamid's

precipitate abdication. It is, I think, obvious that the Turkish officers who rose in rebellion against the Commander of the Faithful, revolted against his rule not as the spiritual head of Islam, but as the temporal ruler who had revoked the constitution he had granted to Turkey at Midhat Pasha's instance. They could hardly have been blamed if, with the view of securing their own safety, they had insisted upon the Sultan's deposition. If this is so they are surely deserving of high commendation for coming to the conclusion that the maintenance of Abdul Hamid upon the throne was manifestly a gain to the constitutional government and for acting on the above conclusion promptly and loyally.

The Young Turks are entitled also to credit for their refusal to make any serious reprisals on the morrow of their unforeseen triumph and for their sincere attempt to enlist the sympathies of the Bulgarian, Servian and Greek inhabitants of Macedonia in support of constitutional government throughout the Ottoman Empire, of which Macedonia has now, more than ever heretofore, become part and parcel. I doubt, however, the moderation and good sense exhibited by the leaders of the military revolution doing much to reconcile the Bulgarians and the Serbs of Macedonia to their permanent incorporation within the Ottoman Empire. Just before the outbreak of the military insurrection in Turkey, the long-cherished hopes of the Balkan Peninsula, and especially of Bulgaria, seemed to be on the very eve of fulfilment. At the instigation, I presume, of the Macedonian Protection Committee, Sir Edward Grey had consented to throw a thunderbolt into the Turkish camp.

The general purport of Sir Edward's proposal may be briefly stated as follows. The Powers interested in the Macedonian question were to present a Collective Note to the Porte enumerating the reforms required in their opinion to secure the pacification of Macedonia, and intimating that if these demands were not accepted the Powers would take collective action to secure their enforcement. How far the British Secretary of State for Foreign Affairs was justified in assuming that he could rely upon the unanimous support of the other Powers, and especially upon that of Russia and Austria, I have no means of saying. It would, however, be inconsistent with the well-deserved reputation of Sir Edward Grey for integrity and straightforward honesty to suppose that he had not secured the co-operation of the Powers in question before he proposed to issue this ultimatum, and had apparently communicated its purport to the Bulgarian Government. The news that the Concert of Europe was prepared to take joint action to compel the acceptance by the Sultan of conditions such as the appointment of an independent and irremov-

HUNT'S MERCHANTS' MAGAZINE

AND

COMMERCIAL REVIEW.

MAY, 1853.

Art. I.—HISTORY OF THE ENGLISH RAILWAYS.*

RAILROADS, as everybody has sagely observed, belong entirely to the Present Day ; Yesterday has no claim whatever to proffer in regard to either their rearing or their paternity. Born and bred in *This Age*—the offspring of the very period to which they have given name and character—nursed by the tender hands of yet Living projectors, and pushed to their existing development by a race of enthusiasts and capitalists whose grandfather generation was ours, also, they are still, and for a time yet will be, regarded among the *newest* of the great triumphs achieved by the Invention of the Nineteenth Century—as, indeed, one of the very juvenilities of Modern Progress. The Slow Coach has not yet become dilapidated under its shed, nor has the deep rut of its wheels been obliterated from the old mail-route. There are hundreds, who by whatever occasion recurring to their former journeyings, are, on even the most public routes, at once afflicted with the uneasy motion of the straining vehicle, as it jogs along over the unequal road, creeping lazily up steep hill-sides and rolling swiftly down to the bottom of deep vales. They shudder, yet, as they are brought to the middle of the trembling old bridge they have so often crossed at the risk of their necks ; and shiver, when they remember the painful cold of the long way, and of the wallowings they were obliged to make on foot through the huge snow-drifts, in which both stage and horses were sometimes almost impassably imbedded. They feel acutely, still, the unhealed ear-lacerations, the incessant infliction for hours and days, of elderly ladies with a very jagged treble, and of respectable old gentlemen whose personal histories were illimitable

* A History of the English Railway ; its Social Relations and Revelations. 1820-45. By JOHN FRANCIS. Author of the "History of the Bank of England—its Times and Traditions ;" and "Chronicles and Characters of the Stock Exchange." 2 vols. London : Longman, Brown, Green & Longmans. 1851.

in adventure and experiment, and whose ancient maxims, trifling anecdotes, and milky witticisms were, severally, legion. They feel, too, the heavy gloom of the wearying silence, that, at other times, reigned for miles and miles, when every passenger seemed to cherish his taciturnity as dearly as his honor; and startle again from this determined lethargy, at the exciting incident of an *upset*, that dread of all stage-wayfarers, in which, if the more serious accidents of killing or the breaking of bones did not occur, there were, at least, bruised heads, sprained wrists, merciless disfigurement of new chapeaus and best bonnets, and such sudden shaking up of the whole internal system of the whole little coach-community, and such dreadful agitation of their nervous system, as, altogether, were not recovered of for the remainder of the journey, however long that might be. The coachman himself, not only survives, but is the actual driver of the iron horse, or officiates as conductor or breakman, and different as his clothes and his character appear from what they were, the unmistakable evidence of his identity is easily found. You shall see in his garret or as the plaything of his children, the very whip, perfect in handle, lash, and snapper, which he flourished so briskly on the coach-box, and the same big hat and long cape in which he took his frequent perch.

Yet, youthful as is this robust Iron Way, and fresh as is the strength of its invincible Carriage, its career has already attained an *historic* importance. The *Statistics* of railways have been for some years sufficiently copious for volumes of such magnitude as McCulloch would not disdain to compile; but their story has now likewise obtained an expansion that may rival, not the records merely of the most venerable inventions and arts, but the annals even of empires. Nay, so abundant is the material that a segment only of the field has found a journalist, who has filled two very respectable octavos of above 300 pages each, from the "*History of the British Railway*" alone. It is, so far as we can judge, a faithful, and therefore, of course, an instructive work, and although the further development of the railway system will occasion, within a few years, the necessity of an enlarged history, it is still, in the meantime, deserving attentive perusal. From the facts in these volumes, we proceed to give an epitome of the very interesting history of the internal communication of England.

In his first chapters, Mr. FRANCIS gives a history of early English Locomotion. The first Roads in England, by which, of course, he means the first broad regular, permanent avenues, in distinction from the ungraded natural or chance pathways before used by the Britons, were laid out by the Romans at the time of their conquest of the Island. These roads were cut out to facilitate the march of their troops, and to connect their various camps. In the following period of the dark ages, roads, if such could be said to exist, were extremely rude and dangerous. "The age of chivalry was a terrible era for the wayfarer." Long journeys were, at that time, performed on horseback, a sort of carriage being only occasionally used. Beside the natural dangers of the way, which as described, were of the most formidable character, the roads were infested by outlaws whose castles were in the depths of the forests, and whose dungeons were the receptacle of the plunder obtained on the highway, and often the grave of the plundered. Journeying was then a terror which few wished to encounter; the fear-inspired piety of the road exceeded that of the sanctuary; "more fervent prayers were heard for safety, on huge, desolate Salisbury plain than were ever breathed in its fine cathedral." In spite of all the efforts of kings, nobles,

and abbots, these freebooters maintained their disagreeable surveillance of the highways, and while some of the nobility and priesthood were obliged to become themselves tributary to them, others of those classes found an interest in conciliating their power by a league. These desperate men have become immortalized in romance.

In the twelfth century, the proceeds of a stall in Salisbury Cathedral were less than the cost of a visit from Salisbury to London. In the fourteenth century, the fare by horse from Canterbury to Dover was sixpence; from Southward to Rochester, twelve pence. During Watt Tyler's insurrection, the mother of Richard II. went from Canterbury to Dover in one day, but her speed was stimulated by fear, as she "never durst tarry on the way." Twenty miles a day was considered good traveling at this time; and the herald of the king of Scotland was allowed forty days to proceed from London to the border.

So late as the 16th century the roads were so tortuous and difficult, the machines for carriage of goods so rough, the transportation so costly, and the exactions of the nobles and abbots on those parts of the roads passing their estates, so onerous, that while scarcity of food prevailed in one district of England, the abundant fruits of the earth rotted in another not very distant. It was easier and less expensive to convey merchandise from London to Lisbon, than from Norwich to London. At this time many of the streets even of London were almost impassable.

The first English coach was built in 1565, by the Earl of Rutland. During the sixteenth century, roads were first made the subjects of legislative enactment, and the initiative was taken in those laws, under which the roads of the country have been brought into a system, and the locomotive accommodation of the public made a prominent care of the government.

To show how difficult is always the introduction of reform, the people of England opposed with bitter antipathy, the first efforts of the legislature. It was long before they could be brought to submit to the payment of tolls on the roads, and to be taxed otherwise for their improvement. The acts of the government were deemed an insufferable tyranny, and if there were any road-reformers among the people, they were undoubtedly decried as pestilent radicals, who designed the destruction of society. It must be remembered that this state of the roads of England, and this state of public feeling in regard to their improvement, existed so late as the brilliant epoch of Queen Elizabeth, when the power of England was felt over the whole world, when her superiority in civilization, arts, and Commerce, was acknowledged, and when such men lived as Shakspeare, Sidney, and Bacon. No doubt England compared then as favorably in regard to her public ways, with the continent, as she did in the other agencies and evidences of civilization.

ROADS, then, are in the simplest form prevailing at present in civilized countries, of quite recent origin. It is comparatively a short time since they began to exist at all; and of course, that Internal Commerce which is so important a feature in the social organization of the present day, and which is the prolific source of an immense portion of the wealth, the comfort, and the intelligence of nations, is almost entirely a thing of modern times. In no way do we obtain so clear, so full a perception of the real condition of states and people in the remoter periods referred to, as by the accounts we are given of their roads.

Until within a very short time, the metropolis of England was a great myth

to the villagers. They knew less of it than an English farmer knows now of Paris or Constantinople—it was more a foreign, an outside place to them than Canton is at present. News of important events were several months in traveling to important towns, now within a day of the capital.

In the seventeenth century, although considerable improvement had been made, it took a viceroy, with all the appliances and appurtenances of wealth, five hours to travel fourteen miles. Heavy goods were transported from London to Birmingham at a cost of £7 a ton, and from London to Exeter, the cost was £12.

In 1662 there were six stage-coaches in all England. In 1669, the flying-coach undertook the journey from Oxford to London between sunrise and sunset. "This spirited undertaking," says Mr. Macaulay, "was solemnly considered and sanctioned by the heads of the university, and appears to have excited the same sort of interest which is excited in our own time, by the opening of a new railway. The success of the experiment was complete. At six in the morning the carriage began to move from before the ancient front of All-Souls' College, and at seven in the evening, the adventurous gentlemen who had run the first risk, were safely deposited at the inn in London." But this coach could not combat the dangers of winter.

In 1706, the stage-coach was first advertised between York and London in four days each way; and in 1712, the effort was made, and succeeded to run a stage all the way from London to Edinburg in thirteen days. The advocates of such rapid traveling were, it seems by the story, regarded by a great many wise men as hair-brained people, who wished to turn the world topsy-turvy and break the necks of all respectable, conservative, easy-going gentlemen.

The popular outbreaks of 1715, 1745, etc., were the occasion of new highways and of the betterment of old ones, measures rendered necessary for the transportation of troops, which is one among the many evidences that can be offered to show that insurrections are productive of some good effects; the very activity of self-defence into which a slothful government is kicked by them, accomplishing often great incidental, though of course undesigned, public benefits.

Up to the middle of the last century, *Peddlers* formed not only one of the most important features of English locomotion, but they were also the principal, and to a great extent the sole, couriers of news from town to country. All that the mass of the rural population could know of the events of the great city, was what they heard from the peddler, all they could ever see of it, was the wares brought from thence in his pack. The peddler wrote letters for the peasants, carried correspondence from one part of the country to another, and was frequently the medium by which the seditious communicated with each other and effected the arrangement of their plots. As the sphere of the peddler was doubtless the same in America at that time, it would seem that a better reason than mere fancy induced Cooper to assign that particular employment to his famous semi-historical character, the Spy.

In 1763, Turnpike-Gates were first established in all parts of England, and for years the chief means for the repair of the roads was derived from them. The state of the roads was still bad enough, but the worst defect and the hardest to remedy, was their general tortuous course. The landed proprietors were the cause of this. The first care of them all was to preserve their estates from invasion, and as their local influence was unlimited, each proprietor had the pleasure of twisting the roads in his own neighborhood,

to whatever courses he chose; subjecting the traveler thus to perpetual sinuosities of way, obliging him to go over many and many a needless mile, to climb steep hills when he might have traversed a level, and to wade through a miry soil when a firm foundation was more easily to be had.

So late as 1770, the roads in the interior of England were in an execrable condition. From that time, however, the stage-coach system rapidly improved and extended, business between town and country augmented, and consequently the roads were placed under better auspices. The power of money was brought to bear upon their defects, invention and scientific skill were set to work, and so great was the transformation that by the year 1825, the roads of England, Mr. Francis assures us, "had reached an almost perfect condition."

But before this time, other agencies of communication had been devised, and were in imperfect operation. The first *Canal* in England was built in 1758, between Worsley and Manchester, by Francis, Duke of Bridgewater, who is often called the father of inland navigation. It was no ordinary work. The level of the water was preserved without the usual obstruction of locks, to effect which the canal was carried over rivers and valleys, surmounted elevated aqueducts and passed through subterraneous tunnels. Public opinion was against the scheme, and the duke was regarded a madman. But he triumphed—the vast work was completed—and the convinced populace and confounded aristocracy could now only wonder and admire. Before the canal was opened, the cost of carriage on the river from Liverpool to Manchester was 12s. a ton, the duke's charge on the canal was limited by statute to 6s. a ton. Other canals followed, a mania arose, and in 1790 the windows of inns were forced by people who came to attend canal meetings, and farmers went at midnight to procure shares which would ruin them. In 1851, there were about 2,400 miles of canal in England.

The earliest approximation to the modern Railway was the modern tram-road. It was between 1602 and 1649 that logs of wood were laid along the roads leading from the coal mines, and on these simple rails it was found that a horse could draw 42 cwt., where he could draw but 17 cwt. before. By 1750, there was scarcely an important mine without its accompanying tram-road. These roads ran directly to a river, if one was near, and in some cases £500 a year was paid for the "way-leave," that is, the right of transportation over intervening grounds. The effect was a rapid increase in the quantity of coal mined and transported.

In 1738 cast-iron rails were first substituted for wooden ones, but did not completely succeed, at first, owing to the too great weight of the old wagons, which had been used on the wooden rails. In 1768 the difficulty was remedied by the simple contrivance of a number of light wagons linked together, in lieu of the large heavy ones. By this means the weight was more diffused on the line of the road, instead of resting upon one spot. The iron rail was, however, very slow in coming into use, and in 1767 the prevailing rail was the wooden.

The first locomotive steam-engine in England was made by Mr. Trevithick, and it was first used in 1804, on the railroad of Merther Tydvil, in South Wales. It drew carriages loaded with ten tons of iron at the rate of five miles an hour. Thereafter steam locomotion was much in men's thoughts, but its immediate fruition was prevented, and the world for years deprived of the incalculable benefit of a new principle and a new power from the fallacy which took possession of men's heads, that smooth wheels

could not be made to carry heavy loads over smooth rails. Years and years were spent in speculations on the means of overcoming this difficulty—treatises numberless were written, plans suggested, and patents taken out; projections were attached to the wheels by one, another attempted to push ahead the iron-horse by a pair of hind legs, like those of its animal predecessor, while a third nearly produced both fore and hind legs; and finally, in 1811, Mr. Blenkinsop of Middleton colliery, conveyed coals by the aid of engines with toothed-wheels worked into a tooth-rack. The rejoicings at this success were great, but about two years after it was discovered that all this remedial effort was wasted, as the difficulty itself was nothing more than imaginary. Mr. Blackett, of Wylm Railway, discovered the fact in using one of Trevithick's engines; and on the 25th July, 1814, the principle was triumphantly proved by an engine constructed under the superintendence of George Stephenson, moving up a slight ascent and drawing after it eight loaded carriages, weighing twenty tons.

The first public line built in England for the use of the steam-carriage was the Stockton and Darlington—this was “the great starting-point of the modern rail.” The act of incorporation was obtained in 1821, and the road was opened in 1825; its length was forty miles, and the cost and capital about £250,000. Its projectors designed the road only for the conveyance of coal and other mineral products, and anticipated the carriage of only about 10,000 tons per annum. Of passengers they had no thought, at first, and when they began to carry them, supposed that the locomotive was incapable of the regularity required for such traffic, and attached horses instead to the passenger cars. As the fruits of the *railway* alone, the travel in this mode rose to five or six hundred weekly, where there had been a coach traffic of fourteen or fifteen persons weekly. The price of coal in the neighborhood fell from 18s. to 8s. 6d.—a new trade in lime arose—and, in short, the customary advantages of a railroad were derived.

The whole number of railways existing at this time in England, which had been constructed between 1801 and 1825, and were, of course, with the exception of one or two of the last, designed for horse-power, and all of them for the carriage simply of coals, &c., was twenty-nine, the entire length of the whole, excepting the Stockton and Darlington, being only about 160 miles, the longest of them not exceeding thirty, and the average being about five miles.

The improvements in machinery and the progress of steam in manufactures had, in 1825, made a vast increase in the importance of the manufacturing city of Manchester, and rendered a greatly enlarged facility of conveyance between that place and Liverpool an absolute necessity. The cotton sent from Liverpool to Manchester had increased fifty millions of pounds in nine years. From 1821 to 1824 the exports of Liverpool had increased by £7,500,000, and the tonnage had increased from seventy-one thousand to more than a million of tons. Still the carriage power between the two places was so limited that accommodation was meted out in rotary order—those who had furnished freight yesterday not being allowed any room to-day. The canal directors held levees, which were attended by crowds, who, admitted one by one, almost implored them to forward their goods. Beside the difficulty of getting conveyance at all, the communication was extremely slow, one company occupying an average of thirty-six hours, and another, of four days in the passage, while, sometimes, the time was longer than that occupied in the voyage from New York to Liverpool. Certain commodities

could obtain no transit. One company carried no timber, another no wheat, and all of them objected to a peculiar kind of cotton as too bulky. The average charge of the canals was 15s. a ton. The first survey for a railroad between the cities was made in 1822. The scheme was hotly opposed, the canal and landed interests being in the lead of the opposition. The friends of the road proposed to compromise with the canal proprietors, but the latter, in the arrogance of their power, and regarding the railway still as a fable, refused to reduce their prices or better the conveniences afforded the public. A bill for a railroad was brought into Parliament, and after thirty-seven days heated discussion in committee of the House of Commons, it failed. But the projectors of the road were not discouraged. Another effort was made, and under the vigorous leadership of Mr. Huskisson the bill passed. While the scheme was in agitation it was attacked by every species of argument that ingenuity could invent. The great point was the injury to be done to the estated gentlemen, as if the interests of the few great landholders of England were worthy of more attention than that of all the rest of the population. The disfigurement of their lands was to be horrible—their fine parks were to be destroyed—foxes and pheasants were to cease—the smoke of the engines would kill all the birds—the estates were to depreciate in value, in fact, would be ruined, and their noble proprietors would be forced, as was said with great pathos in Parliament, to leave forever the places where they had lived so long and happily—to leave them, and go away. Then the farmers were told of the miseries of the railway and locomotive were to inflict upon them: the race of horses would be extinguished, and there would be no market for their hay and oats; their cattle would be seized with dismay in the fields at sight of the engine, and forget all their long habits of submission and order; even the cows would cease to give milk wherever the terrific engine appeared; vegetation itself would cease along the path of the locomotive; the market-gardener would be utterly ruined. Then the life and limb of everybody was to be endangered; old men and children would be mercilessly knocked down and massacred; horses (that is, while horses existed) would be frightened, and run away, knocking out the brains of gentlemen, and dashing ladies to pieces. The sparks from the engine were to set the goods on the train on fire, and carry conflagrations into every wooden town they entered. It was argued, that in point of carriage, even, the railroad was no better than the canal—it was not so good; the canal would beat it in regard to the vaunted speed, and would furnish cheaper conveyance also. The dignified *Quarterly Review* backed up old father Thames against the railway for any sum. Indeed, a strong wind, alone, would be enough to completely stop the locomotive; so would rain; snow would upset it; storm and frost would effectually kill the force of steam. Then the engine, going so fast, would make all the passengers sea-sick: they would be scalded to death by the boiler blowing up, or shot by its fragments. And what, too, was to become of all the coach-makers and harness-makers, coach-masters, coachmen, innkeepers, horse-breeders, horse-dealers, and horse-drivers, when their vocation should be destroyed by the ruthless steam-engine? What was the world to do without iron, when the railways had increased the cost of that necessary one hundred per cent, or, as they more probably would, had exhausted the supply altogether? The people, it was said, would rise in arms against the threatened ruin, and so there would be insurrection or civil war. Railroads, in short, were the greatest evil man's ingenuity could inflict upon England,

and as such Sir Isaac Coffin denounced them in parliament, and Mr. Stanley declaimed against them. Mr. Huskisson's arguments were declared hollow absurdities, and Mr. George Stephenson was quite destitute of common sense.

The lower classes were even more opposed to railways than the landholders. The unpopularity of the locomotive with the classes it was chiefly to benefit can scarcely be described. As Mr. Francis says, the horrors of the infernal regions were figured by it, death and dismay were familiarly connected with it. In such a state of the public mind, and with such powers against them, it may be conceived what obstacles the early friends of railways in England had to contend with. Let it be remembered that this was so late as the year 1825. When we reflect that it is less than thirty years since these things were, the triumph of railways appears, indeed, most wonderful.

The bill for the Liverpool and Manchester road was finally carried by conciliating the principal canal proprietor, and by so altering the proposed route as to avoid the estates of some principal land-owners. The prospectus, from the first, contemplated the *passenger* traffic, this being the first instance in which it had been at all referred to, in the establishment of any railroad, as an element of its support. Geo. Stephenson was appointed engineer, and finished the road in 1829. Three locomotives were produced, in response to the offer of £500 premium for the best—the “Novelty,” by Mr. Braithwaite, the “Sans-Pareil,” by Mr. Hackworth, and the “Rocket,” by Mr. Stephenson. The trial was made on the 6th of October, 1829, in the presence of an immense concourse of people—farmers, mechanics, laborers, scientific men, nobles and legislators—friends and enemies. The Sans-Pareil failed; the boiler of the Novelty burst; the Rocket was awarded the triumph. The greatest speed attained by the Rocket was rather above twenty-nine miles an hour. The effect was electrical. Everybody was forced to believe in, at least, the potency of the steam locomotive; the price of shares in the road rose £10 per cent, and the capital stock was increased in value £65,000. The driver of the successful engine was Charles Fox, the future builder of the Crystal Palace.

The Liverpool and Manchester Railway, as constructed, was thirty miles in length, and independently of culverts and footways had sixty-three bridges, thirty of which passed under the turnpike road, twenty-eight over it, four over streams, and one over the river Irwell. The excavations made in its formation yielded upwards of three million cubic yards of stone, clay, and soil. The road was officially opened on the 30th September, 1830, and with the first train occurred the tragedy of which the lamented Huskisson was the victim. On the 4th December, the first locomotive engine bearing freight passed along the line from Liverpool to Manchester; the train consisted of eighteen wagons, containing 135 bags and bales of American cotton, 200 barrels of flour, 63 sacks of oatmeal, and 34 sacks of malt, weighing, altogether, 51 tons, 11 hundred weight, 1 quarter. The wagons and oil cloths weighed 8 hundred weight, 3 quarters, and the tender, water, and fuel, 4 tons; the whole weight drawn, counting that of fifteen persons upon the train, being eighty tons, exclusive of the engine. The passage was accomplished in two hours and fifty-four minutes. Within fourteen days, the passengers amounted to 800 a day, and immediately after to 1200—the time of the journey was reduced to one hour and a half; within four months the merchandise traffic had quadrupled, rising from 1,432 to 5,104 tons.

The passenger fare at the opening was 7s., but was soon reduced to 4s. The revenue derived from passengers was double that from merchandise. Only one passenger was killed in the first 700,000, and that one by his own carelessness. The £100 shares in the road soon rose to £200. In short, the career of the road thenceforth was a continued triumph. In 1832 the number of passengers carried amounted to 356,000, and in 1835 it had risen to 473,000.

While the Liverpool and Manchester was in progress, various other lines were projected, and unsuccessful efforts made to effect their construction. In 1824-5 a mania existed among the advocates of railroads; fifty-nine roads were projected in 1825 alone, and the capital demanded for the schemes of the two years was £21,942,500, of which £219,425 was actually paid in. But the opponents of railways were still in the ascendant. The old arguments were re-presented and amplified, and parliament threw out all the bills presented. To a number of these schemes many of the merchants and bankers of London gave a cautious support; but, on closely calculating the chances of profit by them, not foreseeing the fact that railroads create trade, they afterward, in good part, withdrew their connection and money. The fierce commercial crisis that followed, "when terror and confusion reigned paramount, and England was within twenty-four hours of barter," put a quietus upon these projects, and from 1825 to 1830 the railway shared the depression of the entire commercial interest, in the languor succeeding the great revulsion.

In 1829, an act for the Newcastle and Carlisle Railway, sixty-one miles in length, was passed, but the road was not finished until ten years thereafter. In 1832 the London and Birmingham was brought before Parliament. In favor of the connection of Birmingham with the metropolis, it was argued that it had a population of 110,000, and a great trade. In one half century one hundred and sixty-nine steam-engines had been erected there, yet carriage had but slightly improved. The shortest journey by canal occupied three days—the railroad would shorten it to six hours; and if a much increased speed were not attained, the Birmingham manufacturer must lose the continental business entirely. But opposition to railroads was far from silent; the enemies of this road appeared almost as an organized party; they declared it would be "a drag on the country," and that its "bridges and culverts would be antiquarian ruins." Again it was repeated that game would cease to be, that meadows would be made sterile, fields disfigured, and agriculture ruined. Canals and their dependents, inn-keepers, horses, &c., &c., were to be irreparably injured—swallowed up by the steam-monster. Hundreds of thousands were to be victimized for the benefit of a few. The rich were to be made beggars—the poor to be more impoverished. The Countess of Bridgewater and Lord Brownlow declared whatever advantage the public might reap would not equal the injury to their estates; and Lord Southampton pronounced the thing positively a nuisance. The tunnels proposed on this and other railways excited especial horror. We find it the general belief, in 1834, that it was not safe to travel through these dark ways. The horrors of the passage was descanted on by public writers and orators in the most glowing style. They talked of "the sudden immersion in gloom," "the clash of reverberated sounds in a confined space," "the rattling wheels," "the pouting, puffing engine," "the clanking chains," "the dismal glare of lamps," "the darkness made visible," the heart-sinking "idea of destruction," the "thrill of annihilation."

There were, too, the less poetic evils of colds, catarrhs, and consumptions, to come from the chill of a two miles' subterranean journey. There was the danger also of suffocation within these dreadful viaducts.

So violent was the opposition, that the survey had, in part, to be conducted at night, with dark lanterns. The first bill for the road was rejected in parliament. But money effected what other argument failed to accomplish. Some of the peers who had so loudly complained of the intended desecration of the historic memories of their mansions, were glad of a chance to replenish their depleted treasuries—and farmers, small landowners, and country gentlemen, were soothed by the same delicate appliance. The bribe was given in the shape of an enormous price for lands, &c., in order that its grossness might be a little concealed, and the law evaded. The amount nominally paid for lands overvalued at £250,000, was three times that amount—and the directors then report, that “nearly all those who were the most active and the most formidable have been conciliated.” By these means the bill passed in 1833.

The London and Birmingham was completed, and opened in its whole length, 112 miles, on the 17th Sept., 1838. Its cost was £504,000. The passenger traffic for the first year was estimated at about £330,000, and reached above £500,000. The goods traffic, estimated at £340,000, reached only about £90,000. The expenses of the year were five and a half millions, and the net profit ten per cent.

The charter of the Great Western Railway was passed in 1835, this road being as violently opposed as the others, and by the same kind of argument. Eton College objected to it that it would be injurious to the discipline of the school, and dangerous to the morals of the pupils; “anybody who knew the nature of Eton boys knew they could not be kept from the railway.” One bill was defeated, and the event was celebrated by a fete at Salthill, the Marquis of Chandos presiding, and the Fellows of Eton College gracing the occasion with their august presence. But the agencies so effective in the case of the London and Birmingham, prevailed here also, and a second bill was passed. The capital was at first £250,000, to be raised on stock, with a loan of £833,333. In 1839 the capital was enlarged by £1,250,000 by stock, and £416,000 by loan. In accordance with the advice of M. Brunel, the engineer of this road, the gauge of seven feet, now called the “broad gauge,” was adopted in place of the common “narrow gauge of four feet eight and a half inches. The *connection* of roads with each other, so as to form continuous lines, was not then foreseen; it was supposed that their conveniences would be mainly local. We believe that the example of the Great Western has been followed by no other road, however, in Great Britain, and it remains alone, therefore, in this singularity. Brunel believed the broad gauge would enable an immense increase of speed over that obtained on the narrow gauge, and he prophesied one hundred miles an hour upon the Great Western. The road was made with a double track, the first one having that feature. The expense of the construction was the enormous sum of £56,594 6s. per mile. The land cost £790,218 14s. 10d., or at the rate of £6,696 15s. 4d.; and the law expenses were £99,091 9d. The receipts of the first four weeks after the road was opened were £14,000. Of late this railway has paid badly.

The London and Southampton Railway was incorporated in 1834, and finished in 1840.

In 1832, while railroads were yet in their very infancy, the English gov-

ernment committed the error of imposing a tax upon their passenger traffic. The rate amounted to one halfpenny a mile for four passengers, or one half farthing each person. The Liverpool and Manchester Company thereupon advanced the fare to three halfpence per mile in place of one penny, as before, and others followed the example. This impost pressed almost entirely on the poor, and was unjust as well as unwise. From this duty the State collected £6,855 in 1835, and in 1840 it reached, by steady augmentation, £72,716.

A remarkable episode in the railway history of England, is the relation between the companies and the landed aristocracy. It was, at the first, the collision between the ancient conservative, lymphatic, unimproving spirit that had ruled the past, and the new-born, progressive, man elevating energy that was to direct the future. One was weak from its infancy, the other was feeble from senility; one was undeveloped—the other exhausted. As always, the new triumphed over the old—and the defeat of the latter carried with it more disgrace than ill-fortune. The result exhibited to the world that the British aristocracy was but a big raree-show—a hollow humbug—a matterless bubble. Their power, their glory, their honor, whatever it *had* been was defunct. They sold land, ancestral possessions, ancient memories, the pride of family, personal character, every thing, for the money of merchants and mechanics, classes whom their fathers, and they too, had affected to despise. They who had abominated traffic descended to the meanest of trade, eagerly chaffering with railroad directors about the pounds and shillings to be paid for their properties, and, yet more, as the price of hushing their hostile voices; every nerve was strained, and every means used, based on the known necessities of the railroad companies, to extort their pelf. Never were misers more greedy of gold—never more indifferent to the means of obtaining it. To such a complexion had British chivalry attained in the nineteenth century.

Another class should be alluded to. When the railway movement commenced, the commercial houses of London were most of them dignified with ancestral honors, awarded to their fathers for their service in the armed vindication of commercial rights. They were allied nearly to the government, being often called on for counsel as well as monetary aid. They were not, in our understanding of the term, men of progress, and not remarkable for adventure. As a class, they were rather cautious in regard to railroads, many of them ranking among their most stubborn opponents. But about 1830 a change was apparent. Many of this class had been ruined in the crisis of 1825, and others were greatly weakened. A new race of traders had arisen, who had made up for their small capital by great activity. The "new men" boldly undertook to innovate, and soon effected a great revolution in commercial forms and customs. They eagerly allied themselves with the new power, which the old houses contemptuously refused to recognize. Their efforts, and the results attending them, forced the others from their inaction, and the entire mercantile power at length became enlisted on the side of railroads—the rapid progress of which was, of course, thenceforth insured.

The London and Brighton road was the occasion of a fierce and factious contest. Five separate lines were projected, and the sums spent in endeavoring simply to obtain an act by the different companies amounted to £193,575. The expenditure for the road, on the successful line, was £37,568 17s. 6d. per mile.

In 1836 the Eastern Counties, the only other road to be particularly noticed, was incorporated. The contest was protracted and eager. During the progress of the matter the company agreed with Lord Petre to pay him £120,000, nominally, for about six miles of way through his estate, really, for the withdrawal of his opposition. Under plea of a misrepresentation, the directors endeavored afterward to escape the payment, but his lordship forced them to observe the contract, adding interest to the amount, the land in question being worth only £5,000. Like "amicable arrangements" were effected with other opponents. The road was the longest, and one of the most expensive built in England, and was completed with great difficulty, the shares being at one time at 50 per cent discount.

In 1836 an effort was made in parliament to pass a general act, making it a condition, that in all future bills the dividends should be limited to a certain rate, and that parliament should reserve the power of periodically revising the tolls on passengers and freight. This would have been a salutary law, but it was not enacted. The principle of the proposed act has, however, been asserted by the government at other times, in fixing a limit to the profit of railways.

Between the years 1832 and 1836 there were built in England about 450 miles of railway, and 350 miles more were in course of construction. This was a healthy progress, being no more than commensurate with the wants of the country.

In 1836, eleven years after the first mania, the second railway fever arose. The benefits of railroad had been completely established, in the face of all opposition. The fact had been discovered that railroads *create* trade and travel where they did not before exist, and there was now an unlimited, an almost superstitious faith in the productive powers of the locomotive. To favor the public inclination money was plentiful, and, comparatively, idle, the current rate of interest being $3\frac{1}{2}$ to 4 per cent. The excitement sprang up as sudden as a tornado, about the month of July. There was scarcely a practicable line between any two considerable places in the kingdom for which a company was not formed, and often there were three or four rival lines started together. The scrip in most of these new companies speedily commanded a premium, and the shares of all the established companies took as sudden a rise. "The press supported the mania; the government sanctioned it: the people paid for it." Twenty and thirty per cent dividends were the general promise of the projectors. Of the five opposition lines designed to Brighton, all were at a premium. In one parish of a metropolitan borough sixteen schemes were afloat, and upwards of one thousand two hundred houses scheduled to be taken down to make room for the rails. Railroads were advertised to places where coaches had never run. One projector designed propelling his engine by sails, and another with rockets, promising, confidently, one hundred miles an hour. Another invented a wooden line to travel the air far overhead. Every possible trick was resorted to to forward the contending projects. Everybody was invited to sign subscription lists, to make up the proportion of the capital required to be paid in in advance of the petition to parliament for incorporation. Clerks and laborers of £50 salary, signed for £35,000, £50,000, or £100,000. One railway paid four shillings, and another ten shillings per head for signatures. Only a small part of all these schemes, of course, succeeded; still, in the session of 1836 there were thirty-five railway bills passed; six of these were for alterations only, twenty-nine being for new

lines, the total length of which was 994 miles, and the estimated cost £17,595,000. Only fifteen of these roads had been finished up to 1843, and several had been abandoned.

But, although there were those of all classes engaged in this furious speculation, their efforts were not uncombated. There were still men whose interest was opposed to railways, in general, as well as those who had objections to particular lines. The bond-holders in turnpike-roads, the coach-owners, many landed gentlemen and others, maintained a lusty war against the over-sweeping excitement. There were cool-headed senators, who raised the cry of warning. Col. Sibthorp, a consistent enemy of steam-locomotion, denounced all railways as public frauds and private robberies. The clergy of Hampshire petitioned against the locomotive, because the rustics kept away from church to see the train pass by, on Sundays. Political economists wrote to prove that railways were absorbing too much of the national capital, and diverting it from the legitimate channels. Poets (real celebrities, too,) indited fierce sonnets against the vapor power and the iron path; and the mourners after "good old times" and departed customs, plaintively declared that England must rid herself altogether of these destructive innovations, and seek her only salvation and only happiness in a return to stage-coaches, canals, and other slow-going respectabilities of machine, principle, and habit—the solid beef which she has so unwisely exchanged for this worse than moonshine in the water.

The reaction occurred in the next year, and the revulsion was terrible. Money became scarce, and shares of every description fell. Ruin overtook alike the powerful and the humble. The misery was felt throughout England. The greatest houses were brought to the edge of the brink, and some of them went over in the struggle. The custom-house receipts fell off nearly a million in a single quarter. Half the cotton mills in the country were shut up. In Manchester and its vicinity 50,000 hands were unemployed for six months. At Glasgow, nearly half the laboring class were starving. It was long before business could resume its natural course, after such a violent commotion.

In 1837, the effect of railroads in driving stage-coaches from the turnpike-roads, and the interference thereby occasioned with the transmission of the mails by the latter, had become so serious that it was necessary to transfer the carriage of the mails to the railroads. To effect this an act was passed, after a long debate, compelling the companies to convey the mails at such hours as the Postmaster-General should direct, for a compensation agreed on between him and the directors. But for the resolute remonstrance of the united railroad interests, it is probable the attempt would have succeeded to force the companies to this accommodation without remuneration.

This difference of principle, on which the earlier railroads were sanctioned and constructed, from that since prevailing, is worthy remark here. At first the railroad was a *public way open to the use of all*. The promoters of the roads freely consented to this, declaring it was no wish of theirs, and could not be to their benefit, to convey passengers or goods, and that their only desire was to be *toll proprietors*. The Legislature had therefore provided that any person might run his own train by paying certain tolls. The owners and occupants of lands adjoining the roads were also allowed to build branch lines, and all were free to use the portion of the roads running through their own lands without paying for the privilege.

This was certainly a more *democratic* system to appearance than that pre-

vailing after; but its evils were soon discovered, and the monopoly plan substituted as one of the necessities of railway management.

The number of acts granted for railways in the United Kingdom between 1826 and 1840 amounted to one hundred and three, about one-third of these being passed in the single session of 1836. About twenty of these roads were for the exclusive carriage of coals, stone, slate, iron, &c., the others for general traffic, though several depended mostly on some particular species of merchandise. The Eastern Counties was the largest of these, its length being 126 miles, with a capital of £2,133,333. The London and Birmingham had the largest capital, £5,500,000, its length being $112\frac{1}{2}$ miles. The Great Western, $117\frac{1}{2}$ miles, had a capital of £4,999,999. The total length of all these roads was about 2,400 miles, and the aggregate capital £64,832,831. Notwithstanding the furore of 1836-7, Great Britain had not in 1840 made a larger investment in railways than her existing business, with its immediate prospects of growth, demanded. All of the roads were not then paying the dividends which had been expected of them, but they were enlarging the capital of the country, and improving the condition of the people, and thus laying a solid foundation for the prosperity of the proprietors. The pecuniary sacrifice in the construction of them had been vast, but the growth of wealth had more than kept pace with these endeavors. The advantages of the railway system were to be seen on all hands. The towns and villages along the lines grew more in a few years after the railroads were built than they had in centuries before. In 1801, the manufactured goods exported from Great Britain were of the value of £7,000,000, by the official returns—in 1840, the amount was £73,000,000. The cotton trade furnished subsistence to about a million and a quarter of persons, most of them dependent on the railway for their maintenance. The population of England increased only 27 per cent between 1770 and 1800; between 1801 and 1831 it augmented 56 per cent. The customs produced £255,000 in 1801, and in 1841 £1,160,000. The personal property of the kingdom was estimated to have risen between 1814 and 1841, from £1,200,000,000 to £2,000,000,000. The entire products of the empire amounted in 1801 to £24,927,684; in 1841, they reached £102,180,517. To no instrumentality had this remarkable prosperity been owing more than to railways.

In 1842, a modification was made in the tax on passengers. Its operation had proved unequal, the burden falling especially on the railways in the poorer districts; one company surrendered 25 per cent of its gross receipts to meet this impost. The effect had been to raise the fares, diminish travel, and to injure the value of the roads. The lines passing through rich districts were, however, little affected by the tax. The substitution made was 5 per cent on the gross receipts of the companies.

In 1842, was commenced the railway clearing-house, on the principle of the banking clearing house, before existing. The object of this system was to enable passengers and goods to go any distance on paying one fare, without the inconvenience of a change of carriage. It was at first vigorously opposed by some of the railroads, but they have gradually yielded to the public demand, until the clearing-house is now employed by fifty-three of the railroads. The adoption of this reform is mainly due to the persevering efforts of Mr. Morrison, Mr. Glyn, and Mr. Hudson.

In 1843, the *gauge* question was re-opened, and the leading engineers of England were questioned in regard to their views thereon. Mr. Geo. Ste-

phenson and his son were alone in their preference for the gauge of four feet eight and a half inches. Mr. Brunel was not asked, as he was known to retain his opinion in favor of the seven feet gauge. Seven other engineers varied in their preferences between these two extremes, no width mentioned being supported by above two names.

In 1844, an effort was made to enact a law which would subject the railroads almost entirely to the control of the government—the attempt was most strenuously resisted by the railway interest, headed by Mr. Hudson, and the effect was a material modification of the act. As passed, the bill empowered the lords of the treasury, twenty-one years after the passing of any future act for a railway, if such railway should realize a profit exceeding 10 per cent on an average of three consecutive years, to revise the scale of tolls so as to reduce the profits to 10 per cent, insuring that amount. Also, to purchase any future railway twenty-one years after incorporation, upon payment of a sum equal to twenty-five years' purchase of the divisible profits on an average of the last three preceding years. Existing railroads, of which there were fifty-five, were exempted from the act. It provided, moreover, that all future railways should provide covered carriages with seats for the third-class passage, the fare not to exceed a penny a mile, with half-price for children between three and twelve years, and free passage for children under three; each passenger to have liberty of half a hundred weight of baggage, without extra charge; these trains to be exempt from taxation. It provided, also, for the establishment of the electric telegraph on all lines of railway.

The victory in this contest was plainly on the side of the railway interest, as this act had been confined in all its important features to *unbuilt* roads. The provision in regard to the third-class cars, practically the most important point of all, ought to have been enforced in regard to every railroad in the kingdom. Some of the companies compelled the third-class passengers to stand in open cars, without seats, for sixteen or seventeen hours together, and this without regard to weather. The effects upon the health of traveling in these conveyances, from rain, snow, cold, and fatigue, could not be otherwise than most disastrous. Yet the companies were unwilling to provide any better accommodations, and when Parliament took up the subject, began to clamor about government tyranny, and exerted every nerve to defeat the humane purpose.

In 1843, twenty-four railway acts were passed, which was not above what the public service required, Mr. Francis thinks. In 1844, thirty-seven more were sanctioned, with an authorized capital stock of £13,981,000, and an allowed loan of £4,006,000—a total of £17,987,000. The initiative of the *third* and greatest railway mania was taken this year. Money was again very abundant—interest from 6 per cent in 1839 had fallen to 2½ per cent, and the temptation was irresistible. The speculation was farther encouraged by a change made in the early part of the year, intended to encourage the building of railways, which had remained nearly stationary under the previous commercial depression, by a reduction of the deposit on projected roads.

Petitions increased so fast in the latter part of 1844, that to check them, an act was passed making the provisional committees liable to the extent of their whole property. The fever rapidly acquired intensity. Sixteen new lines were registered in January, 1845, more still in each of the next two months, and fifty-two in April. The whole number of roads built up to

1844 had been seventy. Everybody who had money, in large or small quantity to invest, from domestics to bankers, sought the railways. The remarkable success of the established roads augmented the flame. As many as twenty journals devoted to the railway interest were established, where only three had existed before, and their profits from railway advertising were fat. The leading papers received at one time £12,000 to £14,000 weekly from this source. The price of iron rose from 68s. to 120s. per ton. All kinds of labor increased in demand, and every branch of Commerce participated in the advantages of the increased activity. The excitement soon rose to madness. People whose money was safely and profitably invested, sold at any price, to get into the share-market. Two-thirds of the members of Parliament were engaged in the speculation, while Parliament was condemning it. In September, four hundred and fifty-seven schemes were registered, although the deposit had been increased to ten per cent. Scrip was sold at the most extravagant prices in lines which, when built, could not realize their working expenses for years. The tricks and frauds of the mania of 1836 were trifling to those now practiced. The details are startling, but we have not room to quote them. At last the phrensy rose to such a pitch, that the thoroughfares near the stock exchanges of some of the English cities were so blockaded by crowds as to be almost impassable, and the very sharebrokers became alarmed at the excitement. To show how far all classes were included in the unholy passion for gain, two hundred and fifty-seven clergymen were dealing in stocks, who had entered to the extent of sums varying from £26,000 to £2,000 each.

On the 16th October the Bank of England raised the rate of interest, and the bubble at once blew up. The people awoke in alarm. The stocks overspread the whole kingdom. Ruin was felt in every village. It is declared by the best informed that no other panic in England was ever so fatal to the middle classes. The crisis was so sudden that the promoters and provisional committee-men had no chance of escaping the fate they had been so much the occasion of to others. "Such was the melancholy close of the high hopes of the memorable spring and summer of 1845."

Since 1845, the progress of railways in Great Britain has been healthy. According to tables lately published, the number of miles of railway in operation in Great Britain, at the present time, is 6,976, which is about one-half the extent existing in the United States, 13,586, and near one-fourth the number of miles existing in the whole world, which is stated at 29,606. The miles of railway in operation in Germany are 5,340; in France, 1,831.

We have already referred to the enormous costs attending the charter, the purchase of land, good will, &c., by some of the English companies. A particular statement of these expenditures on the part of several of the chief roads is worthy of notice:—

	London and South-west'n.	London and Birm'g'm.	London & Brighton.	Great Western.
Land and compensation.....per mile	£4,000	£6,300	£8,000	£6,300
Law, Engineering, and Direction.....	900	1,500	1,800	2,500
Parliamentary expenses	650	650	3,000	1,000
Total.....	£5,550	£8,450	£12,800	£9,800

The London and Birmingham, which cost £8,450 per mile, should have been built, Mr. Francis says, for £4,500 per mile, and probably the other roads need have cost no more than a proportional sum. The sums spent

by the several contesting companies for the Brighton Road, in the endeavor simply to obtain an act, were :—

Rennie's Line	£72,000	Gibb's Line	£26,325
Stephenson's	53,750	South-eastern.....	25,000
Cundy's	16,500		
Total.....			£193,575

In one case £100,000 was spent in Parliamentary operations, without any result. In another case, six counsel and twenty solicitors were employed, at an expense of £57,000. In another, a case of competing lines, the Legislative Committee were occupied on the affair of one road during the whole of one session and a month in the next, at an expense to the petitioners of hundreds of thousands, and then, in despair of a proper conclusion, referred the whole to a military engineer. That such extraordinary disadvantages as these gave so little check to the railway progress of England, is a remarkable evidence of her vast wealth, and of the irrepressible energy of the men who have pushed onward her railway movement.

The "History of the English Railway" is a book well worth attentive study. The railway is of English birth—it was there nurtured and reared—there the effort was made to strangle it in its cradle—there were the devoted friends who stood manfully by it through all report, and brought it out safe, triumphant, from its struggles for being—there it displayed to the admiring world the wondrous vigor of its half-opened energies—and thither came the world, and carried thence the New Power, destined to compress the progress of centuries, ay, almost of milleniads, within the limit of single years. The railroad history of no other country can ever possess the interest of that of England. It occupies the same position in the general annals of steam land carriage, that the steamboat history of America does in the records of steam navigation.

There is, besides, no one subject that, in regard to the development of any of the great civilization movements going forward simultaneously in Great Britain and the United States, better reveals the difference of circumstance thereto attending in the two countries, than the railroad. The difference in the obstacles and opposition in the mode of action, of appliances, even the dissimilarities of object, the varying degrees of magnitude, expense, and of utility in the works, the distinctive modes of their management, exhibit many of the distinguishing features of the political and commercial systems prevailing respectively within the two nations. The congruities of the systems are also revealed, and there are enough of them to afford us a valuable aid from the experience of our English brethren. The leading errors to be avoided are pointed out to us—the safe-ground of enterprise is partially explored and marked out before us.

We have not alluded to all the matters treated of in this work. There are biographies of the "Railway King," of the Stephensons, and notices of other leading men connected with the English railways. There is also a very interesting chapter on Railroad Laborers, and the second volume closes with a brief history of the Magnetic Telegraph.

Mr. Francis is thoroughly acquainted with his subject, and has, perhaps, done it as much justice as any other one man could. His arrangement of matters, and his method of narration are very judicious; his literary abilities are very respectable, and his diction is correct, vivacious, flowing, and conversational, although at times rather ambitious.

In the description of leading incidents and remarkable epochs he is par-

ticularly happy. His detailed history of the great Railroad Mania is especially graphic, and is calculated to profit the moral sense of the reader. We shudder at the nervous picture which he draws of the general demoralization engendered in the frantic pursuit of wealth, of the perverse ingenuity of men honest in nature, but transformed by the demon of speculation, and of the hideous ruin which followed the terrible collapse. We are humiliated with the weakness of human nature exhibited in this singular madness of a whole people—the madness of a people who rank among others as pre-eminent in intelligence, in judgment, in caution—of a people famed for their practical cast of mind, and who boast of their superiority to the accidents of the unilluminated past.

Another remark suggested by these volumes is, the growing custom among men of literary taste and refined temperament, of choosing such unpoetic subjects, as the branches, agencies, or characters of trade, or other like hard, material existence or interest. There was once an inveterate feud between the man of literature and him of barter. The mental habitudes, the desires, aims, labors, everything about the latter were held in ineffable contempt by the former—the life, actions, and motives of the former were as much despised by the latter. But Literature and Commerce (and what has done more to effect the treaty—to open the eyes of each to the merits of the other than Railroads) are now in firm alliance. We have literary merchants and mercantile literateurs. The trader has found that his world-division is susceptible of a general embellishment that does not make yet any fiction of the leger; and the man of imagination has discovered how to make light readings on heavy subjects, and has realized at length the long uncomprehended aphorism, that the romance of Fact far exceeds that of Fiction.

ART. II.—THE BEARING OF PHYSICAL CIRCUMSTANCES UPON THE DEVELOPMENT OF COMMERCE.*

“God,” saith the poet, “never made an independent man.” In civilized society, the mutual dependence of the individuals upon each other, is the great principle which lies at the bottom of the social fabric. And even the wildest savage derives his enjoyments and his scanty comforts, in a great

* The present paper touching the Physical Circumstances upon which the Development of Commerce depends, was originally delivered as a lecture before the students of Comer's Initiatory Counting Rooms, in Boston, and is now first published in the *Merchants' Magazine* in compliance with the wishes of many who heard it. Mr. COMER, the proprietor and manager of that Institution, is justly entitled to the gratitude and support of the public, for his learned and laborious efforts to advance the commercial and industrial interests of the country, by affording our young men the facilities for pursuing the various studies, the acquirement of which are absolutely indispensable to all who aspire to the character of the accomplished merchant. To conduct with credit and success the multifarious operations of a large and liberal Commerce in this nineteenth century, demands a supply of knowledge greater, perhaps, than that required in any of the occupations of life, filled by men who belong to what are technically termed the learned professions.—*Ed. Mer. Mag.*

COMPARATIVE STATISTICS of AUSTRALASIAN RAILWAYS.

By PRICE HOWELL.

[Read (in the author's absence) before the Royal Statistical Society, 21st February, 1899. SIR COURTENAY BOYLE, K.C.B., Vice-President, in the Chair.]

BRITISH interests are largely centred in the successful working of the Australasian railways. For the greater portion of the public debt is absorbed in their construction, and it is from this source that a large part of the colony's revenue is provided.

All the railways (with the exception of a very small mileage) throughout the colonies are under Government control, and not only is the prosperity of each colony largely influenced by the results of the management of the various Commissioners, but the stability of the colony's finances is greatly enhanced by the increased net returns resulting from their efficient management.

The present time, when the question of federal control is being discussed, seems opportune for bringing before the notice of this Society particulars of the extent and working of the Australasian railways and the difference of procedure in each colony.

The railway question is the most important factor in the working out of the problem, and we need not go into the details of the early history of the colonial railways, to make an interesting comparison between State-owned lines and lines constructed and worked by private enterprise.

The extent to which the money borrowed by the colonies has been expended in railway construction is shown by the following statement of the proportion of expenditure on completed lines to the whole indebtedness of each colony up to 30th June, 1896:—

	Per Cent.		Per Cent.
New South Wales	59·19	Victoria	80·00
South Australia	56·72	Queensland	51·66
West „	48·91	Tasmania (December, 1895) ...	41·69
New Zealand (March, 1896) ...	35·97		

The railways being under the control of the various Commissioners in each colony, are not subject to any body such as the Board of Trade in England, or the Interstate Commerce Commission in the United States, for uniformity in the schedules of accounts; consequently in some instances comparative values cannot be arrived at by placing the figures of one report against another, and therefore various anomalies exist in returns of capital, revenue, and expenditure, as will be shown hereafter.

The accounts of the various Railway Commissioners in the Australasian colonies regard the railways, in most cases, only from the date when the lines are opened for traffic. In two cases however the constructing authorities take account of the interest accruing on loans from the time they are raised to the time the lines are completed, open for traffic, and earning revenue.

Although the primary object in these Government undertakings is to make the railways earn sufficient net revenue to cover their interest charges—where the State governs the railway system, lines must of necessity be constructed for the colony's welfare, which, if looked at from a revenue producing standpoint only, would not be attempted.

In the accounts dealing with the Victorian and South Australian railway capital, the expenses of floating the loans and discount in price of raising the money are fully debited to the cost of the undertaking. The aggregate deficiency of the railways in these two colonies to 30th June, 1896, was as follows:—

	Aggregate Net Earnings.	Aggregate Interest.	Deficiency in Meeting Interest.
	£	£	£
Victoria	22,432,645	30,191,898	7,759,253
South Australia	5,929,521	7,703,095	1,773,574

With regard to the South Australian figures, loans to the amount of 881,600*l.* have been finally paid off by the treasury from consolidated revenue. Although the colony is relieved of interest payments on that amount, as the payment of the loans have not been met from net railway revenue, credit should not be taken for these "paid offs" in making comparisons of net railway results on working capital.

The vast area of the Australian continent necessitates a far greater mileage of railway, in proportion to population, than that of any other country. The seven colonies of Australasia comprise an area of 3,077,377¹ square miles, exceeding that of the United States of America (Alaska excluded), which cover 2,970,000² square miles. When we consider the immense traffic that has to be dealt with by reason of the enormous population, and the long distances that the traffic is carried through the latter continent, and compare this with the small demands on the railways on account of the sparse population in the Australasian colonies, we cannot fail to recognise the efficient manner in which the colonial railways are conducted.

¹ Coghlan's "Seven Colonies of Australasia."

² Interstate Commerce Commission Report.

According to the report of the Interstate Commerce Commission, the estimated population of the United States on 30th June, 1893, was 66,551,571, with a mileage of railways of 26·51 miles per 10,000 inhabitants. The population of the Australasian colonies on 31st December, 1895, numbered only 4,238,369 (Coghlan), having 30·50 miles of lines per 10,000 inhabitants (exclusive of private lines). The tonnage of goods traffic dealt with for the year 1896 was as follows:—

	Tons.
United States	765,891,385
Australasia	10,923,839

The following table shows to what extent the railways in Australasia have developed during the past eight years.

Years 1888-96.

	Increase in Capital Expenditure.	Gross Revenue. Aggregate.	Working Expenses. Aggregate.	Net Earnings. Aggregate.
	£	£	£	£
New South Wales	9,129,446	22,692,498	13,495,895	9,196,603
Victoria	9,896,087	23,270,785	15,102,357	8,168,428
South Australia	3,187,910	8,321,653	4,654,160	3,667,493
Queensland (7½ years)	4,590,168	7,298,981	4,659,263	2,639,718
New Zealand	2,072,554	9,018,525	5,688,081	3,330,444
Tasmania	2,358,782	1,137,279	955,421	181,858
West Australia (from 1889)	1,483,741	1,224,196	802,624	421,572
Northern Territory (from 1890)	69,743	92,219	75,448	16,771

The total capital expended, net earnings and interest due, for the year 1896, are shown in the various reports as follows:—

Railways.	Capital Expended.	Interest.	Net Earnings.	Deficiency in meeting Interest.	Surplus.	Year ending.
	£	£	£	£	£	
New South Wales	36,852,194	1,295,590A or 1,377,535B	1,268,529	27,061A or 109,006B	—	June, '96
Victoria	38,108,151	1,438,603	854,917	583,685	—	"
South Australia	12,583,443	468,375	403,478	64,897	—	"
Queensland	16,759,406	693,911	441,132	252,779	—	"
West Australia	2,316,824	94,533	265,911	—	171,378	"
Tasmania	3,521,956	—	29,291	—	—	Dec., '95

The interest charges on the railway debts are worked out on different principles in each colony.

New South Wales Railway Report.

Here it is stated that the rate of interest is taken at the average rate the loans of the colony bear:—

- (A.) On the total capital expenditure, on lines open—less the moneys provided out of the consolidated revenue and the amount of debentures paid off.
- (B.) On the total capital expenditure on lines open.

Victorian Railway Report.

The loans for railway purposes, when issued, are debited in the railway accounts, together with the discounts and expenses on sale of debentures. The interest accruing while lines are in course of construction is charged, a credit being taken on the unexpended balances at the rate of $2\frac{1}{2}$ per cent. for 1896.

South Australian Railway Report.

As in Victoria, the loans for railway purposes are debited against railways when issued, together with discounts and floating charges. Full interest is debited from date of issue, no deduction is made for interest on unexpended balances, but interest is reduced by the amount of loans paid off by the Treasury. A departure from the practice of the other colonies is made by South Australia in charging the amounts of discounts and floating charges of the railway loans against the capital cost of lines constructed, together with a portion (56,035*l.*) of the interest incurred on loans during construction.

Queensland Railway Report.

The amount of the interest on each railway loan is not set out in the reports, but an interest charge of 4 per cent. on the capital expenditure is taken, irrespective of whether the lines are open for traffic or under construction.

West Australian Railway Report.

Specific loans for railway purposes, at par, on amounts expended on lines open for traffic, are considered, but not the cost of floating them. Interest is reckoned on the net amount of the loans expended on lines open for traffic, and interest at the rate of 4 per cent. is taken on amounts obtained from other sources for the construction of railways.

Tasmanian Railway Report.

The amount of debentures raised for purposes of construction are shown in the reports, but the amounts raised for surveys (55,746*l.*), for deferred interest on the Launceston and Western railway (48,000*l.*), and for main line guaranteed interest (87,577*l.*) and the interest on these sums, are not included.

With all these varying circumstances operating, a true comparison of the net value of one colony's railways with those of another cannot be formed on the figures published.

To enable us to arrive at an equitable basis on which the railways of one colony can be compared with those of another, the writer has prepared the following table, from figures compiled from the Treasury returns and from the railway reports of the various colonies. It takes account of what would be chargeable to the railways if interest on total cost of construction was charged (see "b" in statement, Table C), and (also) the actual interest for which each colony is chargeable for railway loans (see "a" in statement, Table C). For details making up these amounts see Tables Nos. III—V.

TABLE C.—*Financial Aspect of the Australian Railways on a Comparative Basis on 30th June, 1896. (Tasmania, December, 1895.)*

Railway.	Total Loans raised for Railway Purposes.	Discounts and Cost of Floating Loans (less premiums).	Net Amount available from Loans.	Less Interest Paid out of Loans.	Less Unexpended Balance.	Amount Expended on Construction.
	£	£	£	£	£	£
S. Wales	—	—	Not obtained	—	—	—
Victoria	36,732,845	548,697	36,184,148	—	1,069,307	35,114,841
South Australia	12,465,793*	433,623	12,032,170	56,035	358,572	11,617,563
Queensland.....	18,631,652	1,135,482	17,496,170	—	148,390	17,347,780
Northern Territory.... }	1,162,780	5,461	1,157,409	136,597	9,764	1,011,048
West Australia	2,199,238	31,770	2,167,468	—	—	2,167,468
Tasmania	3,755,143	—	—	—	224,724	3,493,818

Railway.	Spent on Construction.			"a" Interest for Year. "b"		
	Net Amount from Loans.	From Consolidated Revenue or other sources.	Total.	On Loans Raised.	On Accounts Expended from other sources, taken at 3 %.	Total.
	£	£	£	£	£	£
S. Wales	—	—	Not obtained	—	—	—
Victoria	35,114,841	2,993,310	38,108,151	1,459,743	89,799	1,549,542
South Australia	11,617,563	476,222	12,093,785	468,375	14,287	509,110*
Queensland.....	17,347,780	—	17,347,780	711,203	—	711,203
Northern Territory.... }	1,011,048	10	1,011,058	45,832	—	45,832
West Australia	2,167,468	149,356	2,316,824†	89,862	4,481	94,343
Tasmania	3,493,818	28,138	3,521,956	143,612	844	144,456
				The colonies' indebtedness		The indebtedness of the railways on full capital raised for railway construction

* Of the 12,465,793*l.* loans raised, 881,600*l.* has been finally paid off by the Treasury, thus relieving the colony's indebtedness by the interest on that amount; but as this has not been met from the railway net earnings, interest on the 881,600*l.* at 3 per cent. is included in the "Total interest" column.

† On lines open only.

The Relation of Net Earnings to Capital.

To graphically illustrate the variations of net earnings in relation to capital of the railways in each colony comparatively, the diagram shown on Plate I has been prepared. In it the standard adopted is based on the working of the New South Wales railways for 1888.

The diagram on Plate II shows the comparative relation of working expenses to gross earnings for each colony's railways in the same manner.

[In reading these diagrams it will be observed that (in Plate I) if the net earnings increased annually in a corresponding ratio to the increase in capital, or (in Plate II) if the working expenses increased in corresponding ratio to the gross earnings—the same diagrammatical line would apply in both cases for each sheet.]

As will be observed by reference to Plate II, the fluctuations in revenue and expenditure have been very great during the past twelve years, and this fact is most noticeable in the case of the two leading colonies.

From the years 1885 to 1891 the railway revenue in Victoria rose rapidly, the accumulated revenue during that period being 17,078,826*l.*, outstripping by far the revenue obtained by New South Wales. But, at the same time, it will be seen that the expenditure there during the same period increased at a greater ratio, amounting to 10,879,313*l.* or 63·70 per cent. Since that date the revenue has suffered as rapid a decline, so bringing the gross amount now to less than that obtained in 1887. At the same time the expenditure has been brought down in even a greater degree.

In New South Wales during the period 1885 to 1891 the accumulated revenue was 14,809,473*l.*, while the accumulated expenditure amounted to 9,613,111*l.*, equal to 64·91 per cent. of the total revenue.

For the period 1892 to 1896 inclusive, the accumulated amounts and ratio in the two colonies were as follows:—

Railway.	Accumulated Revenue, 1892-96 inclusive.	Accumulated Expenditure, 1892-96 inclusive.	Compared with previous Six Years.	
			Revenue.	Expenditure.
	£	£	% decrease.	% decrease.
Victoria	13,730,212	8,713,717	19·61	19·91
New South Wales....	14,546,514	8,364,087	1·78	12·99

In considering the amounts which go to make up the gross earnings various circumstances are to be taken into account. Owing to the geographical position of some of the districts in New South Wales with which a large traffic is carried on, the railways of the adjoining colonies are in a position to secure a large share of that traffic, because their seaboard is much nearer, and the railways tap the borders of the colony. This is most noticeable in the case of the large mineral traffic at Broken Hill, which, although in fact, in New South Wales, is only in direct railway communication with South Australia. So the latter colony obtains all the traffic. Victoria is in a position to attract a large share of the wool traffic from the borders of the river Murray in New South Wales, owing to the short distance to Melbourne, as compared with the greater mileage to Sydney.

To compete for this traffic special preferential rates are in vogue in most of the colonies, and have been the cause of keen competition.

Other differences are in charges made for services performed by the railways for other Government departments, which are dealt with differently in each colony.

Queensland railways take the credit under this head for sums amounting to 33,469*l.* during the year, the departments which contributed this non-paying traffic being the Home, Defence, Justice, Treasury, Public Instruction, Public Lands, Mines, and Public Works. The post and telegraph departments are included in the paying traffic, though it is difficult to understand why these are not dealt with in a similar manner to the other Government departments. It was not till last year (1895) that the New Zealand Railway department took a book-keeping credit for services performed for other Government departments (non-paying traffic), and thereby increased the gross revenue to the extent of 36,152*l.* The railway department of South Australia takes credit for services rendered to other Government departments, except those rendered to Parliament, the judges, State children, scholars attending school outside residential areas, and a few minor items. The gross earnings of the West Australian railways include earnings from jetties.

The returns for Victoria and Tasmania do not include the value for services performed for other Government departments.

The extent of the railway systems and the volume of traffic carried on the New South Wales and Victorian railways together, are greater than those of the combined railways of all the other colonies. The combined capital expended on railways and the combined gross and net earnings for the year 1896 give a striking illustration of the extent of the operations in the two leading colonies, viz. :—

	Capital Expended.	Gross Earnings.	Net Earnings.
	£	£	£
New South Wales and } Victorian railways	74,960,345	5,221,809	2,123,446
All other Australasian } Government railways	51,820,071	3,949,398	1,571,301

A comparative table of statistics of all the Australasian Government railways for the year 1896 is shown in Table 1.

The cost of the lines per mile, including equipment, varies from 14,563*l.* for the 4 ft. 8½ in. gauge in New South Wales, down to 3,940*l.* for the 3 ft. 6 in. gauge in West Australia.

The principal causes affecting the cost of the New South Wales railways are the heavy continuous gradients, the substantial formation of the tracks, substantial station buildings and equipment, extensive interlocking and other safe-working appliances, the high price of labour and material when the principal lines were constructed, and the extent of double and quadruple track. On the other hand, the extremely low cost per mile in West Australia is due principally to the large mileage that has been laid down when labour and material were at a very low price; to the fact that in recent cases the contractors have built the lines at a very low rate, recouping themselves by carrying the glut of traffic for some considerable time from the time of completion of line to date of handing over to the Government. Moreover, in West Australia the tracks and buildings are of a light nature, and there are very few stations of importance.

The prime cost value of the railway properties is far higher than the monetary capital cost, for,—apart from the increased value by the creation of populated districts consequent upon having railway communication,—where the land taken for railway purposes is Crown property, under the usually heavy head of property acquired, nothing is debited against the railway capital.

The fact that the passenger and goods train mileage is not kept distinct, except in New South Wales and South Australia, prevents a fair comparison being made of the two classes of earnings throughout the colonies. Having regard to the total train miles run, a great disparity is seen in the various colonies. New South Wales railways obtain the highest earnings per train mile (7*s.* 3·68*d.*), taking the low rates of carriage into account; and the fact that New South Wales earns 191*l.* per average wagon (for the year 1896) with 3·68 wagons per mile of line, as against 136*l.* with 2·67 wagons per mile in Victoria, and 224*l.* for 1·42 wagons per mile in Queensland, shows the long distance traffic and heavy loads that are taken per train on the New South Wales lines.

The West Australian railways, for the length of lines open, have a heavy goods traffic, the average for the year being 3·85 wagons per mile of line, and they earn 153*l.* per wagon.

Gross earnings vary considerably, and may be taken in two groups as under:—

Year 1896.	Per Train Mile.	Per Mile of Line.	Year 1896.	Per Train Mile.	Per Mile of Line.
	<i>s.</i> <i>d.</i>	£		<i>s.</i> <i>d.</i>	£
New South Wales..	7 3·68	1,114	Victoria	5 4·11	769
West Australia	6 10·44	913	South Australia	5 8·57	573
New Zealand	7 1·85	592	Queensland	4 6·91	456
			Tasmania	4 1·36	350

Net earnings take the following order of precedence:—

Year 1896.	Per Train Mile.	Per Mile of Line.	Year 1896.	Per Train Mile.	Per Mile of Line.
	<i>s.</i> <i>d.</i>	£		<i>s.</i> <i>d.</i>	£
New South Wales..	3 3·44	501	South Australia	2 4·04	234
West Australia	3 5·39	458	Victoria.....	1 10·82	274
New Zealand	2 7·32	216	Queensland	1 10·32	185

Working Expenses.

The plans adopted in setting out the details in the schedules of working expenses are not uniform in each colony, and render difficult a comparison of one report with another. In Table I the items have been classified to make as uniform a comparison throughout as is possible; where the item “sundries” occurs, it has been divided *pro rata* over wages and materials.

For the five years 1892 to 1896 inclusive, the amounts spent on maintenance of way and works, per train mile, were as follows:—

New South Wales.	Victoria.	South Australia.	Queensland.	New Zealand.
<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>
1 1·32*	— 8·23	— 10·01	1 3·60	1 8·41

* Includes cost of completely relaying 319 miles of main line railway.

while for the year 1896 the expenditure under that head ranged from 1*s.* 8·51*d.* in New Zealand to 9·39*d.* in South Australia.

General Charges.

Included under this heading, as shown in Table I for the Victorian figures, are “pensions and gratuities,” which are mount-

ing up rapidly and threaten to be a great burden on the working expenses. The amounts thus charged for the five years were as follows:—

1892.	1893.	1894.	1895.	1896.
£ 50,047	£ 60,629	£ 77,854	£ 80,203	£ 89,737

An entire alteration has been made in the schedules of working expenses in the last annual report of the New Zealand railways, the expenses of the departmental offices, amounting to 23,496*l.*, being grouped under one heading. So the branch departments are thus under charged by this amount. But, as a set-off against this, credit recoveries, 16,818*l.*, are also put under a separate heading instead of being distributed over the individual branches to which they belong.

Diagrams designed by the writer, showing the relative variation of branch working expenses and net earnings, in proportion to gross earnings and per train mile, for all the colonies, are shown on Plates III and IV.

Locomotives.

Particulars of all the principal types of locomotives in use on the railways in the Australian colonies are shown on pp. 94—99. A profile of the main trunk line from Adelaide (South Australia) to Brisbane (Queensland) is shown on Plate X, by which an idea can be formed of the nature of the country traversed.

The hauling power of the principal types of engines on the New South Wales lines is given on p. 94.

[From the New South Wales Railway Commissioners' Annual Report, 1895. p.6.]

Grade.	"P" Class.				"J" Class.		"T" Class.	
	Working Passenger Trains.		Working Goods Trains.		Working Goods Trains.		Working Goods Trains.	
	Tons Hauled.	Speed per Hour.	Tons Hauled.	Speed per Hour.	Tons Hauled.	Speed per Hour.	Tons Hauled.	Speed per Hour.
		miles.		miles.		miles.		miles.
1 in 40	225	20	275	10	350	10	350	10
1 „ 75	260	30	505	12	580	12	615	12
1 „ 100	255	35	600	15	620	15	700	15
1 „ 150	330	35	700	18	650	18	750	18

Some very heavy gradients are met with on the Northern and Western lines of New South Wales; on the former line, from

Farquharson to Ben Lomond, a distance of 100 miles, a mean rise of 3,090 feet is met before reaching summit level.

On the Western line, up the Blue Mountains, between Emu Plains and Blackheath, a distance of 37 miles, a mean rise of 3,407 feet has to be negotiated.

Lengths and altitudes of the steepest gradients on the main lines in each colony are given in the following table:—

Table of Steepest Gradients on Main Lines in each Colony.

	Mean Altitude between Stations named.			Mean Altitude between Stations named.	
	ft.	miles.		ft.	miles.
NEW SOUTH WALES.					
Emu Plains to Blackheath	3,407	in 37	NEW ZEALAND.		
" Glenbrook	510	" 4	Belmont to Summit	1,088	in 24
The Great Zig-Zag	588	" 4	Sheffield to Springfield	288	" 6
Farquharson to Ben Lomond	3,090	" 100	Port Chalmers to Mihiwaka	283	" 4
Moral to Hill Top	526	" 4	Mangatera to Mataman	282	" 5
			New Plymouth to Midhurst	1,122	" 27
VICTORIA.					
Wesley to Ingliston.....	987	" 11	QUEENSLAND.		
Ballarat East to Warrenheip ..	312	" 3 $\frac{3}{4}$	Gowrie Jn. to Toowoomba ...	344	" 8
Melbury to Woodend	1,138	" 24 $\frac{3}{4}$	Murphy's Creek to Harlaxton ..	1,220	" 16
Melbourn to Kilmore Junction ...	834	" 24 $\frac{1}{2}$	Grandchester to Victoria.....	298	" 14
			114 mile to Wallangarra	588	" 10
SOUTH AUSTRALIA.					
Millington to Nairne.....	948	" 10	111 mile to 109 mile.....	197	" 2
Woodward to Mount Lofty	1,535	" 16	Maryland to Dalveen	309	" 3 $\frac{1}{2}$

The average annual repairs and renewals to locomotives, covering a period of five years 1892 to 1896, are as under:—

	ft. in.	Wages and Materials.		Materials only.		Total Repairs to Revenue.
		Per Train Mile.	Per Engine.	Per Train Mile.	Per Engine.	
		d.	£	d.	£	
N.S. Wales	4 8 $\frac{1}{2}$ gauge	4·97	309	1·15	72	23·25
Victoria	5 3 "	2·49	213	0·48	41	19·07
S. Australia 3 6 and 5 3 "	5 3 "	3·80	207	1·02	57	26·83
Queensland	3 6 "	1·57	96	0·37	29	29·90*
New Zealand	3 6 "	4·45	216	1·63	81	37·59

* Average over four years.]

Principal Types of Locomotives

Class Letter.	Maker.	Cylinders.		Working Boiler Pressure.	Diameter of Wheels.		Heating Surface.		
		Dia- meter.	Stroke.		Bogie.	Coupled.	Tubes.	Fire- box.	Total.
		ins.	ins.	lbs. per sq. in.	ft. in.	ft. in.	sq. ft.	sq. ft.	sq. ft.
J	NEW SOUTH WALES.								
P {	Baldwin Co., America	21	26	160	2 6	4 3	1,809	158	1,967
T {	Beyer, Peacock & Co., Manchester.	20	26	160	3 3	5 -	1,786	130	1,916
	" "	21	26	160	2 9½	4 3	2,045	166	2,211
	VICTORIA.								
A {	Phoenix Foundry Co., Ltd., Victoria	18	26	140	3 6	5 -	1,056	95	1,151
D {	" "	17	26	140	3 6	5 -	971	83	1,054
R {	Robison, Campbell & Sloss, Victoria	17	26	140	—	4 6	971	83	1,054
X {	Phoenix Foundry Co., Ltd., Victoria	18	26	140	—	5 -	1,313	103·7	1,416
Y {	" "	18	26	140	—	4 6	1,056	95	1,151
E {	Robison, Campbell & Sloss, Victoria	17	26	140	{ radial 3 6 }	5 -	971	83	1,054
	SOUTH AUSTRALIA.								
K {	Beyer, Peacock & Co., England	16½	20	130	—	4 -	830·79	89·38	920·1
P {	J. "Martin & Co., S. Australia	16	20 {	{ 130 & 145 }	—	5 -	817·12	87·49	934·0
R {	Dubs & Co., Scot- land	18	24 {	{ 130 & 145 }	2 11	4 6	1,195·68	98·30	1,293·9
S {	J. "Martin & Co., S. Australia	18	24	145	2 11	6 6	1,123·14	107·52	1,230·6
W {	Beyer, Peacock & Co., England	12	20	130	2 -	3 3	498·68	45·42	544·1
Y {	J. "Martin & Co., S. Australia	14½	20 {	{ 130 & 145 }	2 -	3 3	708·46	69·48	777·9
Z {	" "	15	20	145	2 3	4 6	795·22	73·93	869·1
	QUEENSLAND.								
A 12 {	Baldwin & Co.	12	18	120	2 2	4 -	493	60	553
	Evans, Anderson, Phelan & Co., Queensland								
A 14 {	Phoenix Engineer- ing Co., Queens- land	14	20	140	2 2	4 3	617	72	689
	Kitson & Co., England								
B 13 {	Dubs & Co., Scot- land	13	20	120	2 -	3 3	530	65	595
	Phoenix Engineer- ing Co., Queens- land								

Principal Types of Locomoti

Class Letter.	Maker.	Cylinders.		Working Boiler Pressure.	Diameter of Wheels.		Heating Surface.		
		Dia-meter.	Stroke.		Bogie.	Coupled.	Tubes.	Fire-box.	Total
	QUEENSLAND— <i>Contd.</i>	ins.	ins.	lbs. per sq. in.	ft. in.	ft. in.	sq. ft.	sq. ft.	sq. ft.
B 15	Nasmyth, Wilson & Co., England	15	20	140	2 —	3 —	740	80	82
	Yorkshire Engineering Co., England								
	Evans, Anderson, Phelan & Co., Queensland								
	Walkers, Ltd., Queensland								
C 16	Baldwin & Co., America	16	20	120	2 —	3 —	865	86	95
	TASMANIA.								
A {	Beyer, Peacock & Co., England	15½	22	150	2 4½	4 7	781	80	86
B	" "	14½	20	140	2 —	4 —	704	70	77
C	" "	14½	20	140	2 —	3 3	704	67½	77
D	" "	12½	20	140	2 — leading 3 — trailing	3 9	518	57	57
	WEST AUSTRALIA.								
A {	Beyer, Peacock & Co., England	12	20	130	2 —	3 3	496	54	56
	Dubs & Co., Scotland								
B {	Kitson & Co., England	14	21	140	2 —	3 1	637	59 75 75	67 77 77
	Dubs & Co., Scotland								
G {	Kitson & Co., England	14½	20	140	2 —	3 3	708	72	77
	Beyer, Peacock & Co., England								
	Neilson & Co., England								
G {	J. Martin & Co., S. Australia	14½	20	140	2 —	3 3	703	72	77
	Beyer, Peacock & Co., England								
K	Dubs & Co., Scotland	17	21	160	2 1	3 2	920	93	1,000
N	"	15½	21	160	2 3	4 —	778	89	88
O	"	15½	21	160	2 3	3 —	778	89	88
R	Dubs & Co.	16	22	160	2 3	4 9	819	88	99
T {	Beyer, Peacock & Co., England	15	20	140	2 3½	4 4	767	78	88
	Kitson & Co., England								

use on Australian Railways—Contd.

Total Grate Area.	Weight in Working Order.			Water Capacity.	Coal Capacity.	Tractive Power at 80 per Cent. of Boiler Pressure.	Gauge.
	Engine.	Tender.	Total.				
sq. ft.	tons cwt. qrs.	tons cwt. qrs.	tons cwt. qrs.	gals.	tons.		ft. in.
13'0	27 19 -	23 15 -	51 14 -	1,700	4	14,000	} 3 6
17'79	29 6 -	19 11 -	48 17 -	1,350	5	13,654	
15'75	29 15 -	20 10 -	50 5 -	1,700	2 $\frac{1}{4}$	11,532	} 3 6
14'33	26 5 -	20 10 -	46 15 -	1,700	2 $\frac{1}{4}$	9,812	
13'66	25 10 -	20 10 -	46 - -	1,700	2 $\frac{1}{4}$	12,076	
10'87	28 10 -	—	28 10 -	600	$\frac{3}{4}$	7,777	
9'7	19 12 -	10 15 -	30 7 -	832	1 $\frac{1}{2}$	7,680	} 3 6
10'4 12'5 12'5	32 - -	—	32 - -	600	1 $\frac{1}{2}$	12,621	
14'6	25 4 -	16 18 -	42 2 -	1,200	2	12,076	
14'6	26 15 -	16 18 -	43 13 -	1,200	2	12,076	
16'7	53 - -	—	53 - -	2,000	2 $\frac{3}{4}$	20,443	} 3 6
15'75	44 4 -	—	44 4 -	1,600	2 $\frac{1}{2}$	13,464	
15'75	34 10 -	23 19 -	58 9 -	2,500	5	17,939	
16'28	31 16 -	23 19 -	55 15 -	2,000	5	12,647	
14'6	29 16 -	20 - -	49 16 -	1,700	2 $\frac{1}{2}$	9,692	

Principal Types of Locomotives

Class Letter.	Maker.	Cylinders.		Working Boiler Pressure.	Diameter of Wheels.		Heating Surface.		
		Dia- meter.	Stroke.		Bogie.	Coupled.	Tubes.	Fire- box.	Total.
	NEW ZEALAND.	ins.	ins.	lbs. per'sq. in.	ft. in.	ft. in.	sq. ft.	sq. ft.	sq. ft.
B {	New Zealand	16	22	175	2 6	3 6 $\frac{1}{4}$	939	109	1,048
D {	Government								
F {	Various English	9 $\frac{1}{2}$	18	140	1 6	3 - $\frac{1}{2}$	360	34	394
FA {	makers	10 $\frac{1}{2}$	18	130	—	3 - $\frac{1}{2}$	413	45	458
J {	" " "	12	18	160	—	3 - $\frac{1}{2}$	480	50	530
LA {	New Zealand	14	20	140	2 - $\frac{1}{4}$	3 6 $\frac{1}{4}$	629	57	686
N {	Government	12	18	160	2 2 $\frac{1}{2}$	3 6 $\frac{1}{4}$	535	50	585
O {	Baldwin & Co.,	15	20	135	2 4 $\frac{1}{2}$	4 1 $\frac{1}{8}$	804.2	83.5	487
P {	America	15	18	130	2 4 $\frac{1}{2}$	3 - $\frac{1}{4}$	802	74.5	876
T {	Nasmyth Wilson,	15	20	140	2 2 $\frac{1}{2}$	3 5	780	78	858
U {	England	15	18	130	2 1 $\frac{1}{4}$	3 - $\frac{1}{4}$	737.6	74.8	812
V {	Baldwin & Co.,	16	20	160	2 6	4 6	885	87	972
W {	America	15	20	140	2 2 $\frac{1}{2}$	4 1 $\frac{1}{8}$	780	78	858
WA {	New Zealand	14	20	150	2 2 $\frac{1}{2}$	3 - $\frac{1}{2}$	629.1	53.7	682
	Government	14	20	160	2 4 $\frac{1}{2}$	3 3 $\frac{1}{2}$	680	60	740
	" "								

use on Australian Railways—Contd.

Total Grate Area.	Weight in Working Order.			Water Capacity.	Coal Capacity.	Tractive Power at 80 per Cent. of Boiler Pressure.	Gauge.
	Engine.	Tender.	Total.				
sq. ft.	tons cwt. qrs.	tons cwt. qrs.	tons cwt. qrs.	gals.	tons. cubic ft.		ft. in.
17'3	42 18 -	22 - -	64 18 -	1,700	140	18,662	3 6
8'0	17 - -	—	17 - -	300	22	4,985	
9'0	20 - -	—	20 - -	450	40	5,655	
10'7	24 - -	—	24 - -	600	48	9,090	
12'0	24 - -	17 - -	41 - -	1,200	120	10,391	
10'7	26 12 -	—	26 12 -	650	34	7,853	
16'0	30 15 -	19 10 -	50 5 -	1,400	120	9,918	
15'2	29 5 -	19 10 -	48 15 -	1,300	120	11,700	
15'8	32 10 -	21 10 -	54 - -	1,400	140	12,293	
15'7	28 5 -	17 10 -	45 15 -	1,300	140	11,700	
16'0	38 - -	23 10 -	61 10 -	1,900	125	12,136	
15'8	32 - -	21 10 -	53 10 -	1,400	140	10,300	
12'0	37 5 -	—	37 5 -	900	72	12,888	
12'5	37 5 -	—	37 5 -	800	70	12,623	

Ton-Miles.

If the system universally adopted in America of working out the ton-miles of all goods carried, and the passenger unit-miles, were followed out on all the Australasian railways, a more accurate opinion of the extent of accommodation for each class of traffic could be formed.

At present New South Wales, Tasmania, and South Australia are the only Australasian colonies where the railways prepare statements of the ton-miles; New Zealand formerly took account of the ton-miles on the principal lines, but has now ceased to do so.

For the reasons that the railway systems extend over so large an area in the colonies, and that in some cases heavy suburban traffic is carried only short distances, the total tonnage carried forms no criterion of the extent of traffic transported, as the distance carried fluctuates considerably. For example, during the year 1896 New South Wales railways carried 4,061,131 tons an average of 63·94 miles, while South Australian railways carried 1,056,963 tons an average of 127·58 miles—the total tons carried by the former being 3·84 times greater than that of South Australia, while the volume of traffic transported, when distance carried is taken into account, was only 1·93 times as great.

The revenue earned also shows a wide difference in the respective colonies as under:—

	New South Wales.		South Australia.	
	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>
Per ton carried	7	8·10	12	8·35
„ mile	—	1·44	—	1·19

In the statements of tonnage carried for 1896 the Queensland and West Australian railway reports do not include tonnage of live stock in total tonnage, but all the other colonies include this class of traffic in the total goods tonnage.

The great reductions in rates of carriage that have taken place on the New South Wales lines within recent years, have not only induced a greater volume of traffic, but have caused agricultural and other pursuits to be carried on further inland.

Grain and Flour.—During the year 1879, 36,249 tons were carried an average distance of 99·63 miles, at a rate of 1·03*d.* per ton per mile; the rate of carriage has been reduced recently until in the year 1895 the rate was reduced to 0·58*d.* per ton-mile, which has admitted of the profitable cultivation of land further inland, the average distance this year being 158·58 miles, when

over seven times the quantity of grain was carried, viz., 267,593 tons.

This principle has been adopted with regard to other classes of traffic: hay, straw, and chaff were carried to the extent of 22,467 tons, an average distance of 33·10 miles, at a cost of 1·48*d.* per ton-mile in 1879; inducements were offered by the reductions in rates of carriage to place more land under hay, so that in 1895, with a rate reduced as low as 0·42*d.* per ton-mile, 88,581 tons were carried an average distance of 170·94 miles, the quantity being 6·34 times greater, and the distance 5·17 greater than the corresponding figures in 1879.

In live stock the tonnage has increased 6·47 times—27,805 tons being carried in 1879, as against 179,823 tons in 1895; and the distance conveyed was just doubled, 134·01 as against 268·32 miles, whilst the rates per ton-mile were 2·86*d.* in 1879 and 1·79*d.* in 1895. Other classes of traffic have been dealt with similarly, but there are no statistics available to show the results.

I am indebted to the following gentlemen for information in the compilation of returns contained in this paper, viz.:—Mr. T. Roberts, Loco. Engineer, South Australian Railways; Mr. T. H. Woodroffe, Chief Mechanical Engineer, Victorian Railways; Mr. T. F. Rotheram, Loco. Superintendent, New Zealand Railways; Mr. H. Horniblow, Loco. Engineer, Queensland Railways; Mr. R. B. Campbell, Loco. Engineer, West Australia Railways; Mr. W. E. Batchelor, Loco. Superintendent, Tasmanian Railways; The Under Secretary for the Treasury, Brisbane; Mr. Alpin P. Thomson, Under Secretary for Railways and Works, Perth, West Australia; Mr. A. Day, Secretary for Railways, Adelaide, South Australia, and Mr. R. G. Kent, Secretary for Railways, Melbourne, &c.

NOTE.—It should be remarked that after the diagrams were prepared and reproduced, a substantial reduction in the Queensland rates was accomplished. This (though necessarily, under the circumstances), disregarded in the diagram, has, as far as possible, been read into the text under the author's direction.—ED.

TABLE I.—Comparative Statistics of the

Year ending....		—	New South Wales.	Victoria.
CAPITAL EXPENDED.			June.	June.
Lines open	Total	£	36,852,194	38,108,151
	Per mile	£	14,563	12,272
ROLLING STOCK.				
<i>Locomotives.</i>				
Total	—	No.	521	517
Number per mile worked	—	No.	0·20	0·17
Average mileage run	Per engine	Miles	20,913	22,354
„ earnings	„	£	5,368	4,525
<i>Carriages.</i>				
Total (productive to revenue)	—	No.	851	1,096
Number per mile worked	—	No.	0·34	0·35
Average earnings	Per carriage	£	1,200	1,097
<i>Wagons.</i>				
Total (productive to revenue)	—	No.	9,314	8,339
Number per mile worked	—	No.	3·68	2·67
Average earnings	Per wagon	£	191	136
TRAIN MILES				
Total	Total	Miles	7,719,618	8,989,391
	Per mile of line	Miles	3,050	2,880
RAILWAY EARNINGS.				
Passengers, &c.	—	£	1,021,176	1,202,258
Goods, &c.	—	£	1,775,784	1,137,174
Other receipts	—	£	23,457	61,960
Total		£	2,820,417	2,401,392
Passenger earnings	Per mile of line ...	£	403	385
	„ train mile ...	s. d.	2/7·75	2/8·10
Goods, &c., „	„ mile of line ...	£	702	364
	„ train mile ...	s. d.	4/7·21	2/6·36
Other receipts	„ mile of line ...	£	9	20
	„ train mile ...	s. d.	-/0·72	-/1·65
Total earnings	„ mile of line ...	£	1,114	769
	„ train mile ...	s. d.	7/3·68	5/4·11

Australasian Government Railways, Year 1896.

South Australia.	Queensland.	New Zealand.	Tasmania.	West Australia.	Northern Territory.
June.	June.	March.	Dec., 1895.	June.	June.
12,583,443 7,305	16,759,406 7,024	15,487,219 7,694	3,521,956 8,390	2,316,824 3,940	1,151,223 7,912
308 0·18 15,540 3,115	275 0·12 18,836 3,947	270 0·14 15,728 4,230	61 0·14 15,222 2,242	74 0 13 — 6,800	6 0·04 7,089 2,154
289 0·17 999	328 0·14 990	509 0·25 872	204 0·48 309	107 0·18 1,517	5 0·03 754
5,618 3 26 119	3,390 1·42 224	8,319 4·16 84	898 2·10 82	2,232 3·85 153	133 0·91 69
3,452,648 2,004	4,744,734 1,993	3,307,226 1,655	727,577 1,703	1,541,750 2,658	31,721 218
288,594 670,961 26,945	324,790 760,704 —	443,970 698,115 40,956	63,006 73,738 12,898	162,343 340,851 26,422	3,772 9,149 2,184
986,500	1,685,494	1,183,041	149,642	529,616	15,105
168 1/8·06 390 3/10·64 15 -1/8·7	136 1/4·43 320 3/2·48 — —	222 2/8·22 349 4/2·66 21 -2/9·7	148 1/8·78 172 2/0·32 30 -4/2·6	280 2/1·27 588 4/5·06 45 -4/1·1	26 2/4·54 63 5/9·22 15 1/4·52
573 5/8·57	456 4/6·91	592 7/1·85	350 4/1·36	913 6/10·44	104 9/6·28

TABLE I *Contd.*—Comparative Statistics of the

Year ending...		—	New South Wales.	Victoria.
			June.	June.
WORKING EXPENSES.				
<i>Maintenance of Way and Works.</i>				
Salaries, office expenses, &c.	Total	£	27,630	<div>Wages, 290,641</div> <div>Materials, 75,207</div>
Maintenance of way ...	{ Wages	£	223,314	
Bridges, stations, buildings	{ Material	£	52,410	
Sundries	{	£	37,439	
	Per engine	£	10,171	
Total way and works	—	£	350,964	365,848
	Per mile of line	£	139	117
	„ train mile	s. d.	-/10-91	-/9-77
	„ cent. of gross earnings	Per cent.	12-44	15-24
<i>Locomotive Expenses.</i>				
Superintendence, office expenses, &c.	Total	£	24,773	11,600
	Per engine	£	48	22
	„ train mile	d.	0-77	0-31
	Total	£	226,553	196,819
	Per engine	£	435	381
	„ train mile	d.	7-04	5-26
	Total	£	71,488	117,970
	Per engine	£	137	228
	„ train mile	d.	2-22	3-15
	Total	£	38,622	26,392
	Per engine	£	74	51
	„ train mile	d.	1-20	0-70
	Total	£	132,007	78,207
	Per engine	£	253	151
	„ train mile	d.	4-11	2-09
	Total	£	38,939	19,502
	Per engine	£	75	38
	„ train mile	d.	1-21	0-52
	Total	£	170,946	97,709
	Per engine	£	328	189
	„ train mile	d.	5-32	2-61
	Total	£	532,382	450,490
	Per engine	£	1,022	871
	„ train mile	s. d.	1/4-55	1/0-03
	„ cent. of gross earnings	Per cent.	18-88	18-76
	„ mile of line	£	210	144
	Total	£	143,799	88,258
	Per train mile	d.	4-47	2-36
	„ cent. of gross earnings	Per cent.	5-10	3-68
	„ mile of line	£	57	28

Australasian Government Railways, Year 1896.

South Australia.	Queensland.	New Zealand.	Tasmania.	West Australia.	Northern Territory.
June.	June.	March.	Dec., 1895.	June.	June.
17,006	11,163	{ Combined under special heading }	—	—	1,018
		140,815	—	—	
118,063	237,304	60,039	—	—	
		78,496	—	—	9,624
		3,243	—	—	
135,069	248,467	282,593	46,548	56,036	10,642
78	105	141	109	97	73
-9·39	1/0·57	1/8·51	1/3·35	-/8·73	6/8·52
13·69	22·89	23·89	31·10	10·58	70·45
12,320	7,515	{ Combined under special heading }	—	—	268
40	27	—	—	—	45
0·85	0·38	—	—	—	2·02
85,964	76,816	75,646	—	—	894
279	279	280	—	—	149
5·98	3·89	5·49	—	—	6·77
45,248	44,308	41,890	—	—	454
147	161	155	—	—	76
3·15	2·24	3·04	—	—	3·44
17,964	15,082	8,689	—	—	146
58	55	32	—	—	24
1·25	0·76	0·63	—	—	1·10
41,457	20,004	39,974	—	—	459
135	73	148	—	—	76
2·88	1·01	2·90	—	—	3·47
18,626	10,104	19,469	—	—	63
60	37	72	—	—	11
1·29	0·51	1·41	—	—	0·48
60,083	30,108	59,443	—	—	522
195	110	220	—	—	87
4·17	1·52	4·31	—	—	3·95
221,579	173,829	185,668	38,381	101,692	2,284
719	632	687	629	—	381
1/3·40	-/8·79	1/1·47	1/0·66	1/3·83	1/5·28
22·47	16·01	15·69	25·65	19·20	15·12
129	73	93	90	175	16
62,882	29,467	54,693	—	—	257
4·37	1·49	3·97	—	—	1·95
6·37	2·72	4·62	—	—	1·70
37	12	27	—	—	2

TABLE I *Contd.*—Comparative Statistics of the

Year ending...		—	New South Wales.	Victoria.
			June.	June.
WORKING EXPENSES—<i>contd.</i>				
<i>Traffic Expenses</i> (including oiling and greasing).....	Total	£	443,130	499,583
	Per train mile	<i>s. d.</i>	1/1·78	1/1·34
	„ cent. of gross earnings	Per cent.	15·71	20·80
	„ mile of line	£	175	160
<i>General Charges</i> (including gratuities and pensions).....	Total	£	64,757	134,776
	Per train mile	<i>d.</i>	2·01	3·60
	„ cent. of gross earnings	Per cent.	2·30	5·61
	„ mile of line	£	26	43
<i>Compensation</i>	Total	£	15,248	7,321
	Per train mile	<i>d.</i>	0·47	0·19
	„ cent. of gross earnings	Per cent.	0·54	0·31
	„ mile of line	£	6	3
<i>Departmental Offices</i> (not charged against each branch)	Total	£	—	—
	Per train mile	<i>d.</i>	—	—
	„ cent. of gross earnings	Per cent.	—	—
	„ mile of line	£	—	—
<i>Credit Recoveries</i> (not credited to individual branches)	Total	£	—	—
	Per train mile	<i>d.</i>	—	—
	„ cent. of gross earnings	Per cent.	—	—
	„ mile of line	£	—	—
TOTAL WORKING EXPENSES	Total	£	1,551,888	1,546,475
	Per train mile	<i>s. d.</i>	4/0·24	3/5·29
	„ cent. of gross earnings	Per cent.	55·02	64·40
	„ mile of line	£	613	495
NET EARNINGS	Total	£	1,268,529	854,917
	Per train mile	<i>s. d.</i>	3/3·44	1/10·82
	„ cent. of gross earnings	Per cent.	44·98	35·60
	„ mile of line	£	501	274
	Average per cent. to capital cost	Per cent.	3·44	2·24
GROSS EARNINGS	Total	£	2,820,417	2,401,392
	Per train mile	<i>s. d.</i>	7/3·68	5/4·11
	„ mile of line	£	1,114	769
ACCIDENTS (whether from own want of caution or not).				
To passengers.....	Killed	—	1 in 10,502,524	1 in 13,664,599
	Injured	—	1 „ 420,109	1 „ 397,998
„ employees	Killed	—	1 „ 1,218	1 „ 1,106
	Injured	—	1 „ 125	1 „ 65
TOTAL MILES OPEN		Miles	2,531½	3,122½
AVERAGE „		Miles	2,531½	3,121

Australasian Government Railways, Year 1896.

South Australia.	Queensland.	New Zealand.	Tasmania.	West Australia.	Northern Territory.
June.	June.	March.	Dec., 1895.	June.	June.
146,127	166,966	207,253	29,891	94,389	1,805
-10·16	-8·44	1/3·04	-9·86	1/2·69	1/1·65
14·81	15·38	17·52	19·98	17·82	11·95
85	70	104	70	163	12
15,841	25,633	14,483	5,531	11,588	300
1·10	1·30	1·05	1·82	1·80	2·27
1·61	2·36	1·22	3·69	2·19	1·99
9	11	7	13	20	2
162	} Included under other heads	} Included under other heads	—	—	1
0·01			—	—	—
0·02			—	—	0·01
—			—	—	—
—	—	23,496	—	—	—
—	—	1·71	—	—	—
—	—	1·99	—	—	—
—	—	12	—	—	—
—	—	16,818	—	—	—
—	—	1·22	—	—	—
—	—	1·42	—	—	—
—	—	8	—	—	—
583,022	644,362	751,368	120,351	263,705	15,289
3/4·53	2/8·59	4/6·53	3/3·69	3/5·05	9/7·67
59·10	59·36	63·51	80·42	49·79	101·22
339	271	376	282	455	105
403,478	441,132	431,673	29,291	265,911	Loss 184
2/4·04	1/10·32	2/7·32	-9·67	3/5·39	—
40·90	40·64	36·49	19·58	50·21	—
234	185	216	68	458	—
3·21	2·63	2·80	0·83	11·48	—
986,500	1,085,494	1,183,041	149,642	529,616	15,105
5/8·57	4/6·91	7/1·85	4/1·36	6/10·44	9/6·28
573	456	592	350	913	104
Nil	} Not published in report	} 1 in 4,162,426 1 „ 320,187 1 „ 995 1 „ 44	} Not published in report	} Not published in report	Nil
2,717,978					„
Nil					„
1 in 120					„
1,722 $\frac{1}{4}$	2,386	2,013	419 $\frac{3}{4}$	588	145 $\frac{1}{2}$
1,722 $\frac{1}{2}$	2,380	1,998	427 $\frac{1}{4}$	580	145 $\frac{1}{2}$

TABLE II.—Railway Rates for the Prince

Colony.	Class of Goods.	Conditions.	—	Miles.	
				10.	20.
AGRICULTURAL PRODUCE.					
N. S. Wales {	Grain of all kinds, flour, and potatoes {	“Up” journey; minimum 6 tons	per ton	s. d. 1 3	s. d. 2 —
Victoria {	Grain of all kinds (except potatoes)	“Down” journey.....	”	2 5	3 —
S. Australia {	Potatoes only.....	Minimum 6 tons	”	2 —	2 —
	Agricultural produce ..	” 3 ”	”	1 3	2 —
Queensland {	Grain of all kinds.....	” 3 ”	”	3 —	5 —
	” ” and potatoes	” 1 ”	”	1 6	2 10
N. Zealand {	Flour, bran, pollard	In truck loads for shipment	”	2 6*	3 9
	Grain of all kinds, flour, and potatoes {	Minimum 1½ tons.....	”	1 3	2 —
				3 5	4 —
HAY, STRAW, CHAFF.					
N. S. Wales....	—	Minimum 6 tons	”	1 8	1 10
Victoria	—	” 5 ”	”	2 6	3 —
S. Australia {	—	”	{	1 4	2 —
	Hydraulic or steam pressed	” 5½ tons, broad gauge		”	—
N. Zealand	—	Minimum 4½ tons, narrow gauge	”	—	—
	—	—	—	—	—
FRUIT.					
N. S. Wales....	Fresh, packed	—	per ton	2 —	2 10
Victoria	” ” in cases	—	”	2 9	3 10
S. Australia....	”	3 tons.....	”	2 —	3 —
Queensland....	”	Minimum 1 ton	”	2 6	3 —
N. Zealand	”	—	”	5 2	6 —
DAIRY PRODUCE.					
N. S. Wales {	Dairy produce, butter, eggs, cream, &c.	Minimum 1 ton	”	2 2	3 10
Victoria {	Dairy produce (not otherwise specified) {	Actual weight	”	3 10	7 —
S. Australia {	Dairy produce, butter	Minimum 10 cwt.	”	3 10	6 —
	Dairy produce (not otherwise specified) {	” 3 tons.....	”	3 —	5 —
Queensland {	Dairy produce, butter, eggs, cheese, &c.	1 ton	”	2 6	3 —
N. Zealand	Butter, packed	Minimum 10 cwt.....	”	5 10	9 —
MEAT.					
N. S. Wales {	Fresh	Minimum 4 tons	”	2 6	3 —
Victoria {	Frozen	” 12 ”	”	—	—
S. Australia....	Fresh	” 5 ”	”	2 9	3 10
	Fresh	” 8 ”	”	—	—
Queensland {	Fresh	” 3 ”	”	3 —	5 —
	”	—	”	3 —	5 —
N. Zealand	Frozen	Minimum 6 tons	”	—	—
	Fresh	—	”	6 5	10 —

* A rebate of 20 per

of Goods Carried. Year 1896.

Miles.									
30.	40.	50.	75.	100.	150.	200.	300.	400.	500.
d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
—	3 11	- 4 9	- 6 9	- 8 —	- 9 8	-11 4	- 12 4	- 13 4	- 14 —
9	6 —	- 7 2	-10 4	- 13 —	-18 —	1 2 5	1 9 —	1 15 7	2 2 2
6	5 —	- 5 6	- 7 6	- 9 4	-12 4	-16 4	-19 —	1 1 1	—
9	3 6	- 4 3	- 6 3	- 8 4	-11 8	-15 —	1 1 8	1 8 4	—
4	9 5	-11 6	-15 8	-19 10	1 7 1	1 14 5	2 9 —	3 3 7	3 18 2
3	5 6	- 6 9	- 8 10	-10 11	-14 1	-16 2	1 — 4	1 4 6	1 8 8
—	6 3	- 7 6	-10 8	- 13 9	-17 11	1 2 1	1 8 4	1 14 7	2 — 10
11	3 9	- 4 7	- 6 8	- 8 9	-11 11	-15 —	-19 2	1 3 4	1 7 6
2	7 10	- 8 8	-10 7	-11 7	-13 8	-15 7	-19 8	1 3 10	1 8 —
7	3 2	- 3 10	- 4 4	- 4 8	- 6 6	- 8 1	- 9 9	- 11 2	- 12 6
—	5 —	- 5 6	- 8 —	-10 6	-15 —	-17 —	-19 1	1 1 2	—
10	4 11	- 6 1	- 7 11	- 9 10	-12 8	-14 7	-18 3	1 2 —	1 5 9
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
11	5 —	- 6 —	- 8 7	-10 10	-15 —	-18 8	1 4 2	1 9 8	1 15 2
6	6 8	- 8 3	-11 7	-14 11	-19 6	1 4 1	1 10 11	1 17 10	—
10	6 1	- 7 4	- 9 5	-11 6	-14 7	-17 9	1 4 —	1 10 3	1 16 6
—	6 3	- 7 6	-10 8	-13 9	-17 11	1 2 1	1 8 4	1 14 7	2 — 10
3	11 9	-13 —	-15 11	-17 5	1 — 6	1 3 5	1 9 6	1 15 9	2 2 —
6	7 2	- 8 10	-13 —	-17 2	1 4 8	1 11 4	2 1 4	2 11 4	3 1 4
—	14 11	-18 2	1 7 6	1 16 11	2 15 —	3 8 9	4 11 8	5 10 —	—
5	12 2	-14 11	1 2 —	1 8 8	2 2 5	2 11 7	3 5 4	3 14 6	—
4	9 5	-11 6	-15 8	-19 10	1 7 1	1 14 5	2 9 —	3 3 7	3 18 2
—	6 3	- 7 6	-10 8	- 13 9	-17 11	1 2 1	1 8 4	1 14 7	2 — 10
5	14 11	-17 5	1 3 2	1 6 6	1 12 9	1 16 6	2 4 10	2 13 2	3 1 6
9	5 7½	- 6 10½	- 9 4½	-12 5	-16 10½	1 2 1	1 12 6	2 2 11	2 13 4
6	6 8	- 8 3	-11 7	-14 11	-18 9	1 3 11	1 14 4	2 4 9	2 15 2
1½	4 4½	- 5 6	- 8 2½	-10 11	-19 6	1 4 1	1 10 11	1 17 10	—
4	9 5	-11 6	-15 8	-19 10	1 7 1	1 14 5	1 12 10	2 3 9	—
—	10 6	-13 —	-18 3	1 3 5	1 11 9	2 — 1	2 9 —	3 3 7	3 18 2
—	—	—	—	1 — 10	1 9 2	1 17 6	2 12 7	3 5 1	3 17 7
6	18 7	1 2 11	1 9 8	1 13 7	2 — 1	2 3 10	2 5 10	2 14 2	3 2 6
—	—	—	—	—	—	—	2 12 2	3 — 6	3 8 10

ved on these rates.

TABLE II *Contd.*—Railway Rates for the Prince

Colony.	Class of Goods.	Conditions.	—	Miles.					
				10.		20.			
COAL.									
N. S. Wales {	For home consumption	Minimum 6 tons	per ton	£	s.	d.	£	s.	d.
	„ shipment	In Commrs.' } including wagons.... } cost of In owners' } shipping wagons.... }	„ {	—	—	—	—	—	—
Victoria {	brown coal, lignite and	Minimum 6 tons	„	1	3	—	1	3	—
S. Australia.... {	coke	„ 3 „	„	2	—	—	3	—	—
Queensland.... {	—	„ 3 „	„	1	3	—	2	—	—
N. Zealand {	Native brown coal	Minimum 4 tons	{	„	1	9	—	2	—
	„ anthracite or bituminous			„	2	6	—	3	—
TIMBER.									
N. S. Wales {	Logs, mining props, piles, and girders	Minimum 6 tons	„	1	3	—	2	—	—
Victoria {	Logs, piles, hardwood, &c.	„ 6 „	„	—	—	—	—	—	—
S. Australia {	Mining props, slabs, &c.	„ 7 „	„	2	—	—	2	—	—
	S. Australian grown....	„ 3 „	{	„	2	—	—	3	—
Logs, piles, girders, hardwood (imported)	„			5	—	—	7	—	
Queensland {	Logs, piles, girders, hardwood	—	„	2	6	—	3	—	—
N. Zealand {	Native grown	—	100 sup. ft.	—	—	8	—	1	—
	Imported	—	„	1	—	—	2	—	—
WOOL.									
N. S. Wales {	Greasy	—	per ton	—					
Victoria	Scoured	—	„	15	—	21	—	—	—
S. Australia {	Greasy	—	„	5	—	—	—	7	—
	Scoured	—	„	6	6	—	—	9	—
N. Zealand	Undumped	In bales of 4 cwt.....	„	5	—	—	—	9	—
LIVE STOCK.									
N. S. Wales....	—	In truck loads	per truck	15	—	—	15	—	—
Victoria {	Full rate	„ „	{	„	1	—	—	1	—
	Store rate			„	15	6	—	15	—
	Sheep only, off-day rate			„	18	2	—	18	—
	„ „ goodstruck rate			„	10	—	—	10	—
S. Australia {	Cattle or horses	„ „	{	„	10	—	—	11	—
	Sheep			„	10	—	—	11	—
Queensland {	Cattle (except north- ern line).....	„ „ containing 6 cattle or horses	{	„	5	—	—	9	—
	Sheep (except central railway)	In truck loads, containing 70 sheep.....		„	7	—	—	11	—
	Cattle or sheep	In truck loads, containing 6 fat cattle or 50 to 60 fat sheep		„	15	—	—	15	—
ORES.									
N. S. Wales {	Ores under 50l. per ton in value	Minimum 6 tons	per ton	1	3	—	2	—	—
Victoria {	Copper, lead, tin, ores, clays, &c.	„ 2 „	„	2	9	—	3	—	—
S. Australia.... {	Copper, lead, silver, &c.	„ 5 „	„	1	6	—	2	—	—
Queensland.... {	—	—	—	1	3	—	2	—	—
N. Zealand {	—	Minimum 4 tons	—	1	9	—	2	—	—

Special local rates to specified stations are not shown in the above table

of Goods Carried. Year 1896.

Miles.									
30.	40.	50.	75.	100.	150.	200.	300.	400.	500.
s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
3 1	- 4 -	- 4 10	- 6 3	- 8 2	- 11 -	- 13 1	- 16 11	1 - 1	1 3 1
2 -	- 2 6	- 3 -	—	—	—	—	—	—	—
1 8	- 2 1	- 2 8	—	—	—	—	—	—	—
2 9	- 3 6	- 4 3	- 6 3	- 8 4	- 11 8	- 15 -	1 1 8	1 8 4	—
4 10	- 6 1	- 7 4	- 9 5	- 11 6	- 14 7	- 17 9	1 4 -	1 10 3	1 16 6
2 11	- 3 9	- 4 7	- 6 8	- 8 9	- 11 11	- 15 -	- 19 2	1 3 4	1 7 6
3 9	- 4 7	- 5 5	- 6 11	- 7 11	- 10 -	- 12 1	- 16 3	1 0 5	1 4 7
5 -	- 6 4	- 7 8	- 9 4	- 10 2	- 11 10	- 14 2	- 19 3	1 4 3	1 9 3
3 1	- 4 -	- 4 10	- 6 3	- 8 2	- 11 -	- 13 1	- 16 11	1 - 1	1 3 1
—	- 4 -	- 5 -	- 7 6	- 10 -	- 15 -	1 - -	1 10 -	2 - -	—
3 -	- 3 6	- 4 3	- 6 3	- 8 4	- 11 8	- 15 -	1 1 8	1 8 4	—
4 10	- 6 1	- 7 4	- 9 5	- 11 6	- 14 7	- 17 9	1 4 -	1 10 3	1 16 6
9 6	- 12 -	- 14 6	1 - 9	1 7 -	1 18 6	2 9 11	3 8 8	4 3 3	4 17 10
5 -	- 6 3	- 7 6	- 10 8	- 13 9	- 17 11	1 2 11	1 8 4	1 14 7	2 - 10
1 8	- 1 11	- 2 2	- 2 11	- 3 2	- 3 8	- 4 2	- 6 -	- 8 1	- 10 2
2 6	- 2 11	- 3 3	- 4 5	- 4 9	- 5 6	- 6 3	- 9 -	- 12 1	- 15 3
36.	78.	97.	105.	120.	150.	204.	249.	301.	406.
- 11 4	1 5 3	1 11 8	1 13 11	1 17 10	2 5 5	2 18 -	3 4 7	3 12 2	4 - -
- 14 7	1 12 6	2 - 10	2 3 9	2 8 11	2 18 11	3 14 11	4 4 4	4 15 1	5 - -
	101.	116 & 113	196.	245.	295.				
9 6	- 13 6	- 16 6	1 4 6	1 18 6	2 9 11	3 8 8	4 3 3	4 17 10	
3 3	- 12 -	- 14 6	1 - 9	1 7 -	1 18 6	2 9 11	3 8 8	4 3 3	4 17 10
4 7	- 17 -	- 1 - 9	1 10 2	1 19 6	2 16 9	3 13 11	5 2 -	6 3 11	7 5 9
	- 19 2	1 3 4	1 11 3	1 17 1	2 2 1	2 7 1	2 17 11	3 8 4	3 18 9
- -	1 6 8	1 13 4	2 10 -	3 3 4	4 2 1	4 18 9	6 7 11	7 17 1	9 6 3
3 6	1 10 6	1 18 -	2 15 6	3 13 6	4 6 -	5 13 -	8 8 6	11 4 -	—
8 1	1 3 4	1 9 -	2 2 1	2 15 7	3 5 -	4 5 3	6 6 10	8 8 6	—
1 4	1 7 8	1 14 5	2 10 2	3 6 4	3 17 7	5 1 11	7 11 10	10 1 10	—
5 6	1 - -	1 5 -	1 17 -	2 8 6	3 1 -	4 - 6	6 - -	7 19 6	—
7 6	1 3 4	1 9 2	2 1 8	2 14 2	3 15 -	4 11 8	5 16 8	7 1 8	8 6 8
3 -	- 16 6	1 - 6	1 10 6	2 - -	2 16 6	3 13 6	5 1 -	6 3 6	7 5 6
4 6	- 18 6	1 2 -	1 11 6	2 1 -	2 15 6	3 10 -	4 11 -	5 7 6	6 4 -
- -	1 5 -	1 10 -	2 1 8	2 10 -	3 2 6	3 13 9	4 18 9	6 3 9	7 8 9
3 1	- 4 -	- 4 10	- 6 3	- 8 2	- 11 -	- 13 1	- 16 11	1 - 1	1 3 1
5 6	- 6 8	- 8 3	- 11 7	- 14 11	- 19 6	1 4 1	1 10 11	1 17 10	—
2 6	- 3 4	- 4 2	- 5 9	- 7 4	- 9 11	- 12 6	- 17 9	1 2 11	1 8 2
2 11	- 3 9	- 4 7	- 6 8	- 8 9	- 11 11	- 15 -	- 19 2	1 3 4	1 7 6
3 9	- 4 7	- 5 5	- 6 11	- 7 11	- 10 -	- 12 1	- 16 3	1 - 5	1 4 7

rates quoted for South Australia are those for February, 1897.

TABLE III.—*Victorian Railways.*

Loan Act.	Loans Issued for Railways.	Net Amount Realised.	Rate.	Interest for Year.
	£	£	Per cent.	£
42 Vict., No. 608.....	4,156,574	—	4½	—
33 " 439.....	88,873	—	4	—
37 " 468.....	1,450,000	—	4	—
39 " 531.....	1,396,693	—	4	—
45 " 717.....	2,769,026	—	4	—
46 " 739.....	2,000,000	—	4	—
46 " 741.....	107,600	—	4	—
47 " 760.....	3,758,788	—	4	—
43 " 805.....	3,251,172	—	4	—
49 " 845.....	4,500,000	—	4	—
51 " 963.....	130,000	—	4	—
53 " 1,015.....	500,000	—	4	—
57 " 1,341.....	150,000	—	4	—
56 " 1,287.....	2,107,000	—	4	—
56 " 1,296.....	454,672	—	4	—
58 " 1,369.....	153,900	—	4	—
52 " 989.....	2,673,913	—	3½	—
53 " 1,032.....	3,150,000	—	3½	—
54 " 1,196.....	2,226,087	—	3½	—
55 " 1,217.....	1,666,667	—	3½	—
42 " 617.....	31,900	—	5	—
Total.....	36,732,845	36,184,148	—	1,459,743*

* Including expenses in payment of interest.

TABLE IV.—*South Australian Railways.*

Num- ber.	Year Issued.	Loans Issued for Railways.	Net Amount Realised. Railway Loans.	Rate.	Finally Paid-off by Treasury.	Interest for Year on Outstanding Loans.
		£	£	Per cent.	£	£
18	1853.....	150,000	150,000	6	} 504,100	—
18	'54.....	250,000	250,000	6		
27	'55-56	36,000	36,000	6		
9	'57-58	68,100	73,000	6		
10	'57-58	76,800	80,000	6	76,800	—
2	'58.....	36,800	40,000	6	36,800	—
20	'59.....	12,600	13,500	6	12,600	—
2	'60.....	33,500	35,350	6	33,500	—
23	'62.....	12,800	14,000	6	12,800	—
1	'66-67	45,300	48,000	6	45,300	—
15	'66-67	18,600	20,000	6	18,600	—
25	'66-67	73,400	77,000	6	21,100	—
28	'66-67	500,000	533,252	6	120,000	—
25	'72.....	160,000	147,918	4	—	—
2	'74.....	450,000	403,567	4	—	—
18	'74.....	82,000	76,238	4	—	—
24	'75.....	200,000	188,077	4	—	—
47	'76.....	2,188,500	2,053,983	4	—	—
57	'76.....	65,418	58,005	4	—	—
77	'77.....	416,641	387,288	4	—	—
129	'78.....	1,800,186	1,673,358	4	—	—
159	'79.....	234,830	234,830	4	—	—
189	'80.....	88,300	88,300	4	—	—
227	'81.....	631,594	630,073	4	—	—
272	'82.....	1,071,600	1,055,044	4	—	—
297	'84.....	635,000	633,234	4	—	—
334	'84.....	1,060,400	1,053,283	4	—	—
362	'85.....	553,900	545,127	4	—	—
391	'86.....	17,000	17,000	4	—	—
449	'88.....	354,569	348,155	3½	—	—
491	'90.....	817,620	756,045	3½	—	—
549	'92.....	245,016	237,210	3½	—	—
553	'92.....	238,714	238,598	4, 11, 3	—	—
611	'94.....	100,470	96,600	3	—	—
Less, trans- ferred to other un- dertakings }		12,725,658	12,292,035	—	—	—
		259,865	259,865	—	—	—
Total		12,465,793	12,032,170	—	881,600	468,375

TABLE V.—*Queensland Railways. Statement showing Total Loans Issued; Railway Proportion of same; Net Amount Realised; Rate and Amount of Interest.*

[Compiled from particulars kindly supplied by the Under Secretary to the Treasury.]

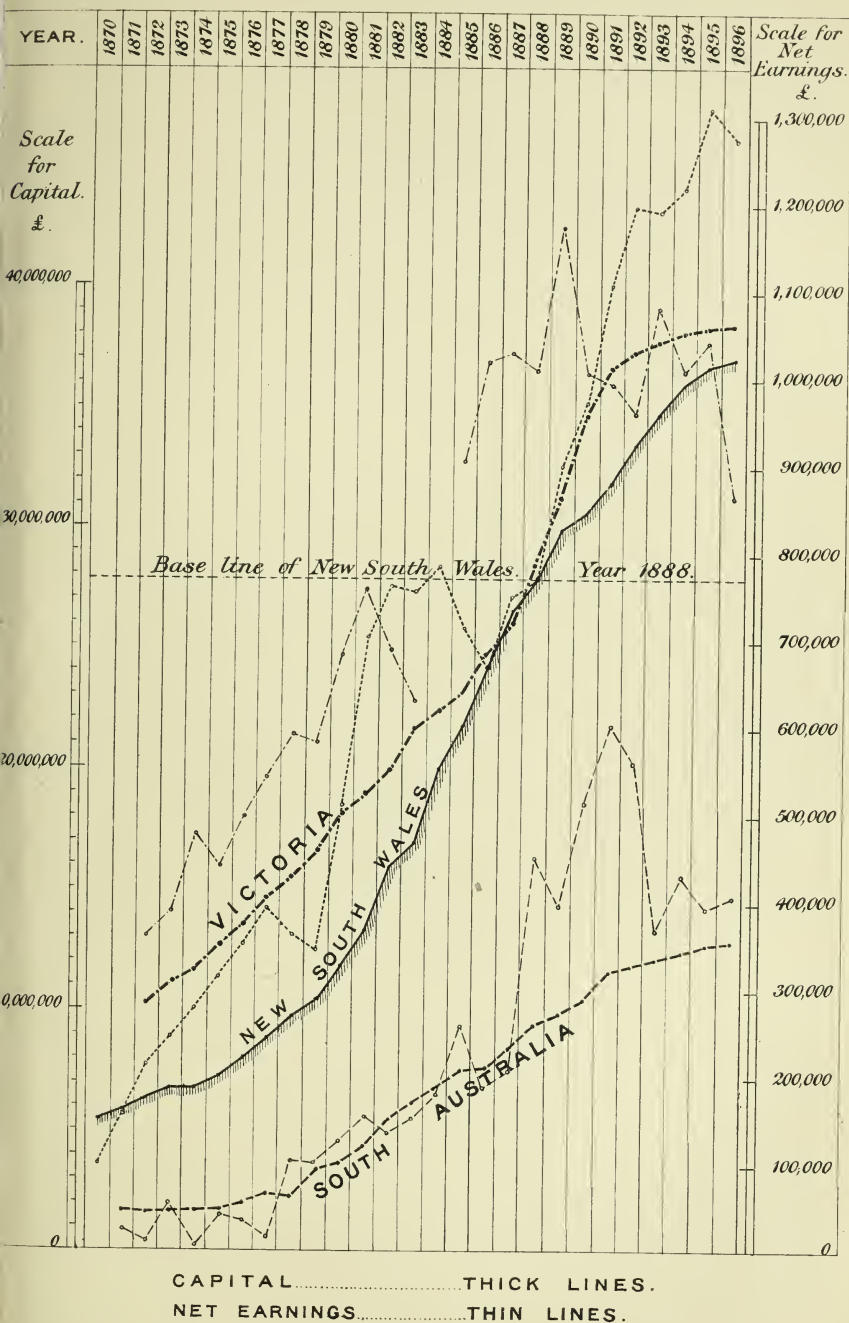
Year Issued.	Total Loans Issued.	Loans Issued for Railways.	Net Amount Realised, Railway Proportion.	Interest.	
				Rate.	Annual Amount.
	£	£	£	Per cent.	£
1872	1,466,500	686,000	601,982	4	—
'75	1,695,300	766,600	694,561	4	—
'76	740,700	126,100	113,729	4	—
'77	1,322,000	751,600	689,367	4	—
'78	1,184,800	820,000	723,748	4	—
'79	3,053,000	2,024,100	1,883,566	4	—
'81	1,089,500	336,400	321,985	4	—
'82	2,643,500	1,822,000	1,759,440	4	—
'84	1,439,000	847,000	826,167	4	—
'84 No. 2....	6,750,000	4,677,967	4,567,014	4	—
'84 „	3,230,000	2,239,033	2,104,055	3½	—
'89	1,554,834	931,834	895,056	3½	—
'90	3,704,800	2,256,450	1,969,933	3½	—
'94	2,000,000	346,568	345,567	3½	—
Total	—	18,631,652	17,496,170	—	711,203

TABLE VI.—*West Australia Railways.*

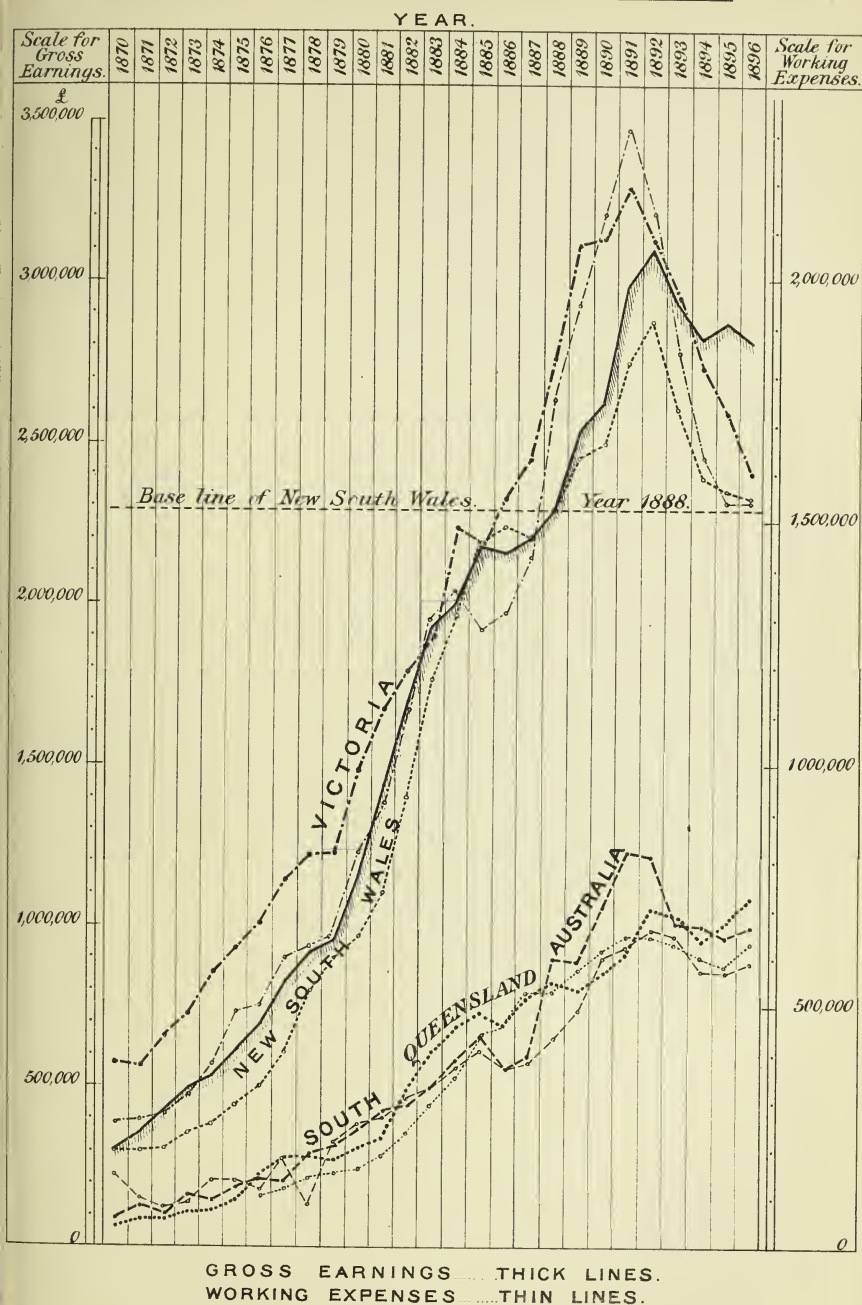
[Compiled from particulars kindly supplied by the Under Secretary for Railways and Works.]

Year Issued.	—	Loans Issued for Railways. (Proportion.)	Net Amount Realised for Railways.	Interest.	
				Rate.	Annual Amount.
		£	£	Per cent.	£
1872	—	1,675	1,675	6	—
'73	—	89,000	88,061	5	—
'75	—	26,060	26,000	5	—
'78	—	141,751	137,144	4½	—
'81	—	100,047	97,046	4	—
'82	—	200,557	194,139	4	—
'84	—	272,586	264,000	4	—
'88	—	4,841	5,233	4	—
'91	—	908,284	891,754	4	—
'93	—	364,191	371,475	4	—
'94	—	90,246	90,941	4	—
Total		2,199,238	2,167,468	—	89,862

RELATION OF NET EARNINGS TO CAPITAL.



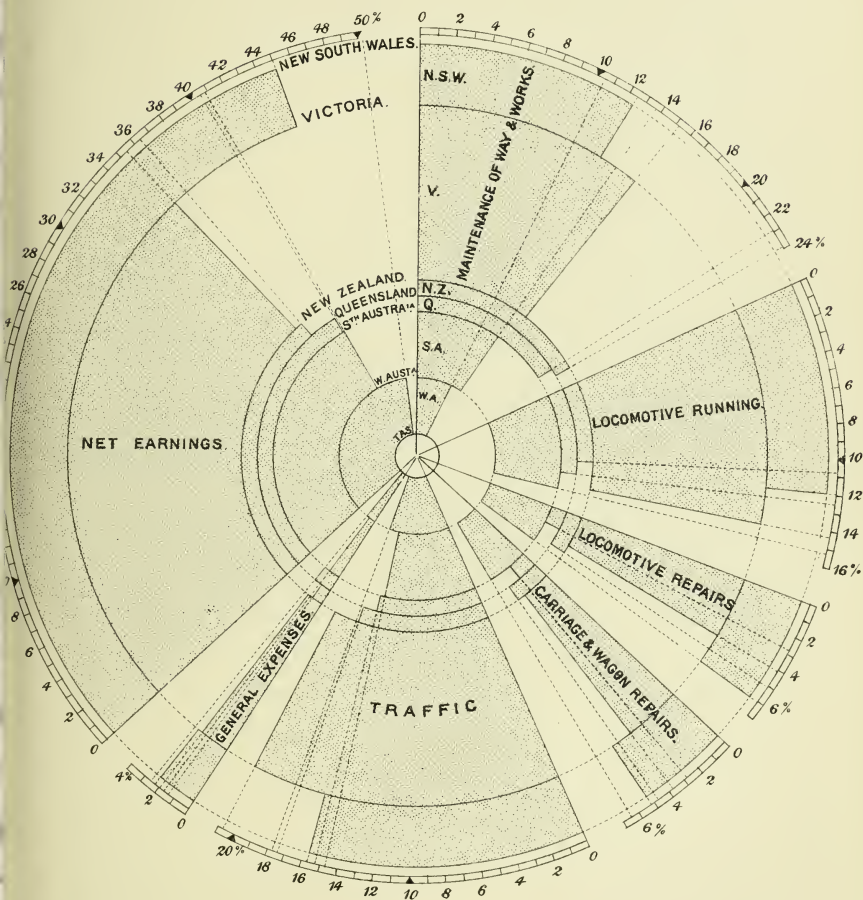
RELATION OF EXPENDITURE TO REVENUE.



To preserve the comparison, the half years of the following have been doubled, viz:-
(Vic.) 1871 & 1884. (S.A.) 1878. (Q.) 1889.

YEAR 1896.

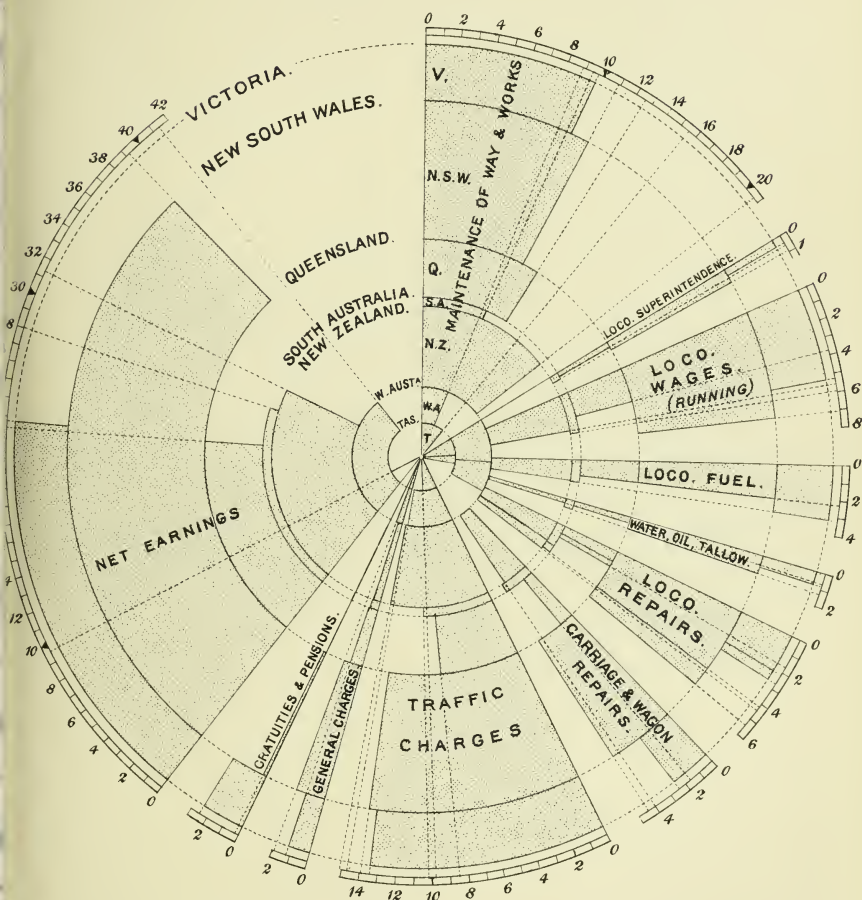
RELATIVE VARIATION OF WORKING EXPENSES & NET EARNINGS
IN PROPORTION TO
GROSS EARNINGS.



PER-CENT OF GROSS EARNINGS.

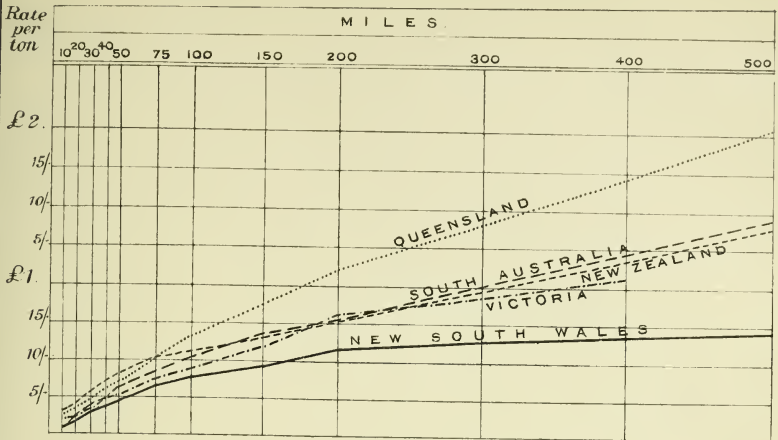
YEAR 1896.

RELATIVE VARIATION OF WORKING EXPENSES & NET EARNINGS
IN PROPORTION TO
TRAIN MILES.

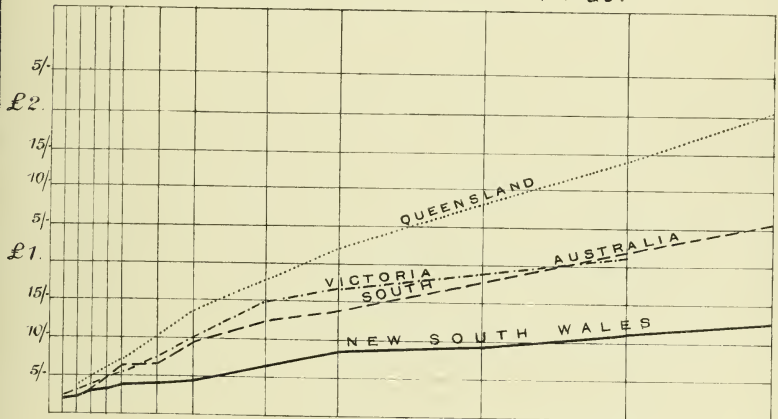


COST IN PENCE PER TRAIN MILE.

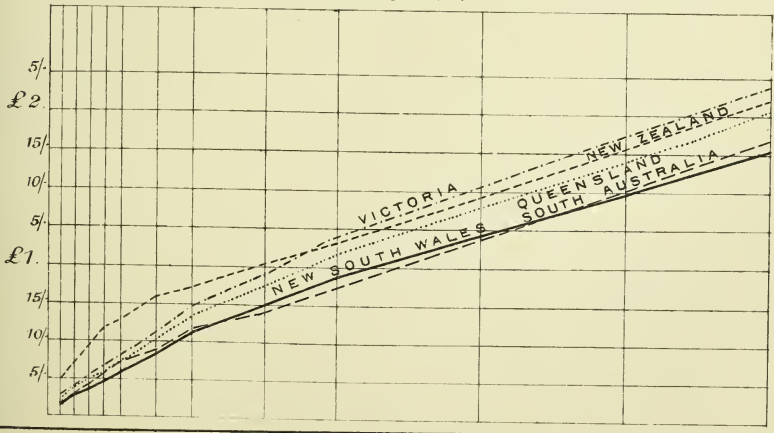
AGRICULTURAL PRODUCE.



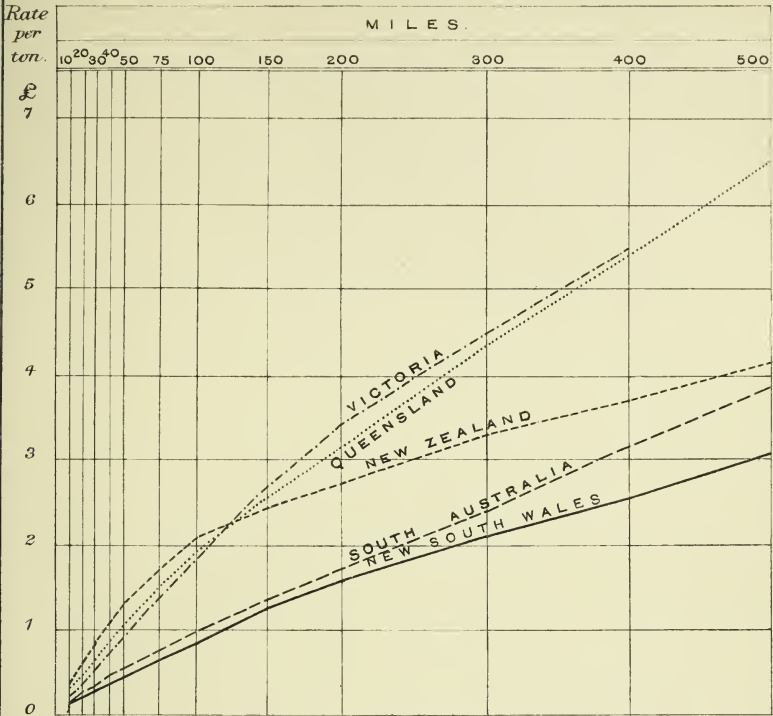
HAY, STRAW & CHAFF. &c.



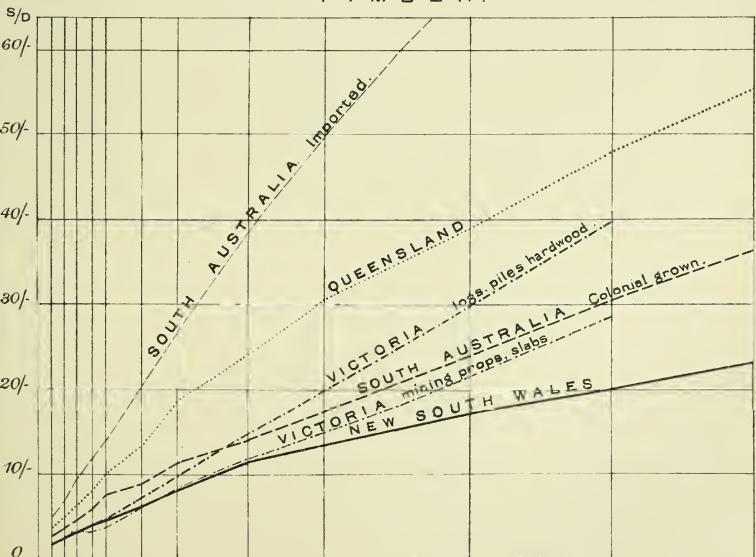
FRUIT.



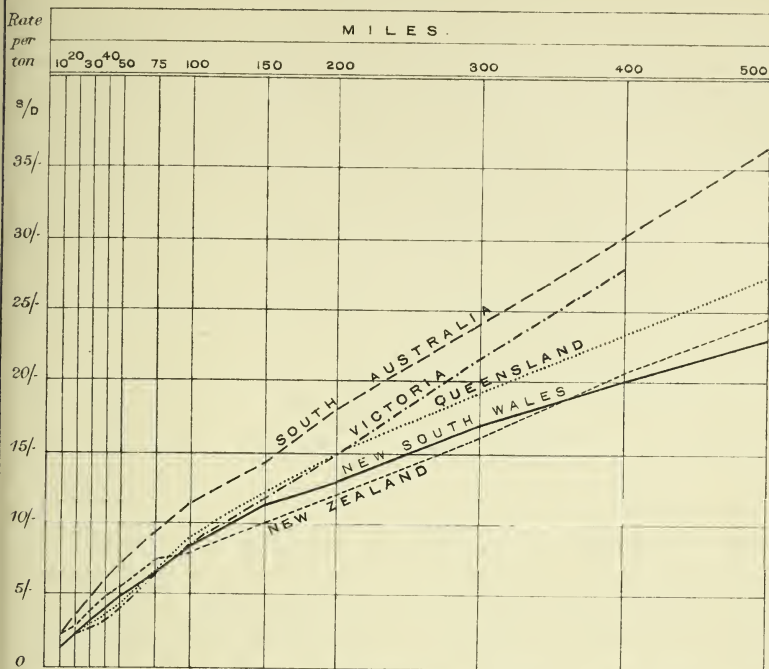
DAIRY PRODUCE.



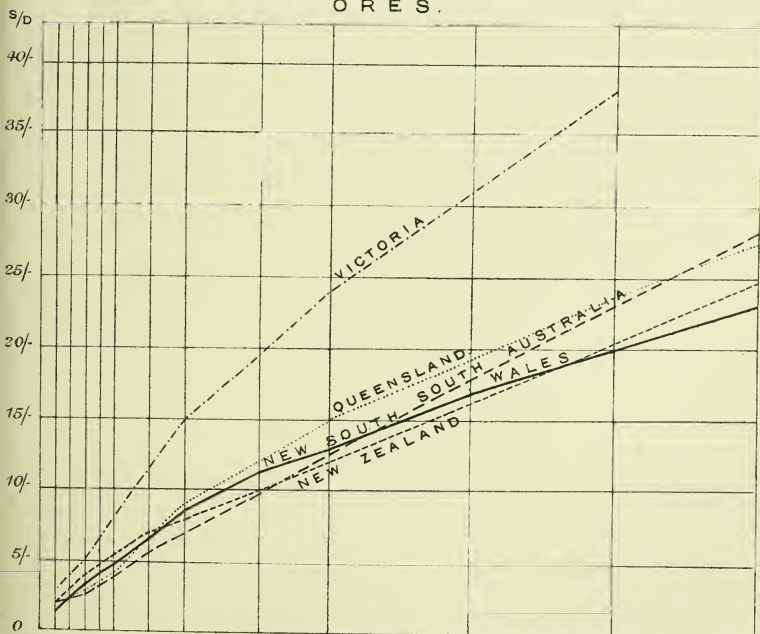
TIMBER.



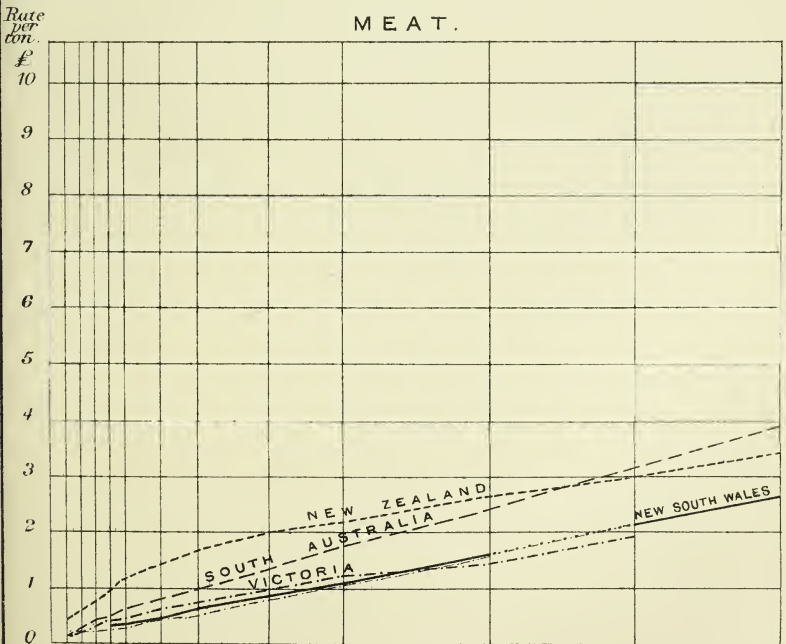
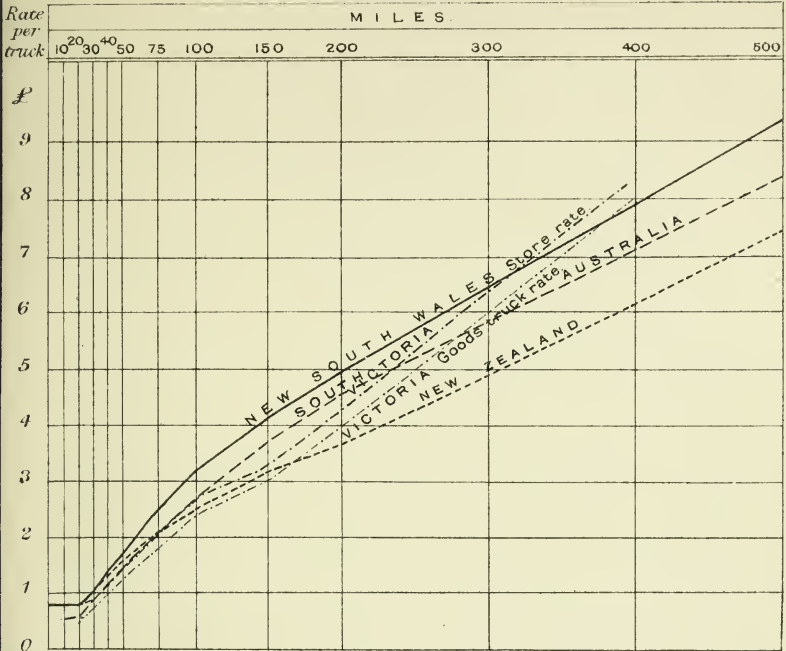
COAL.

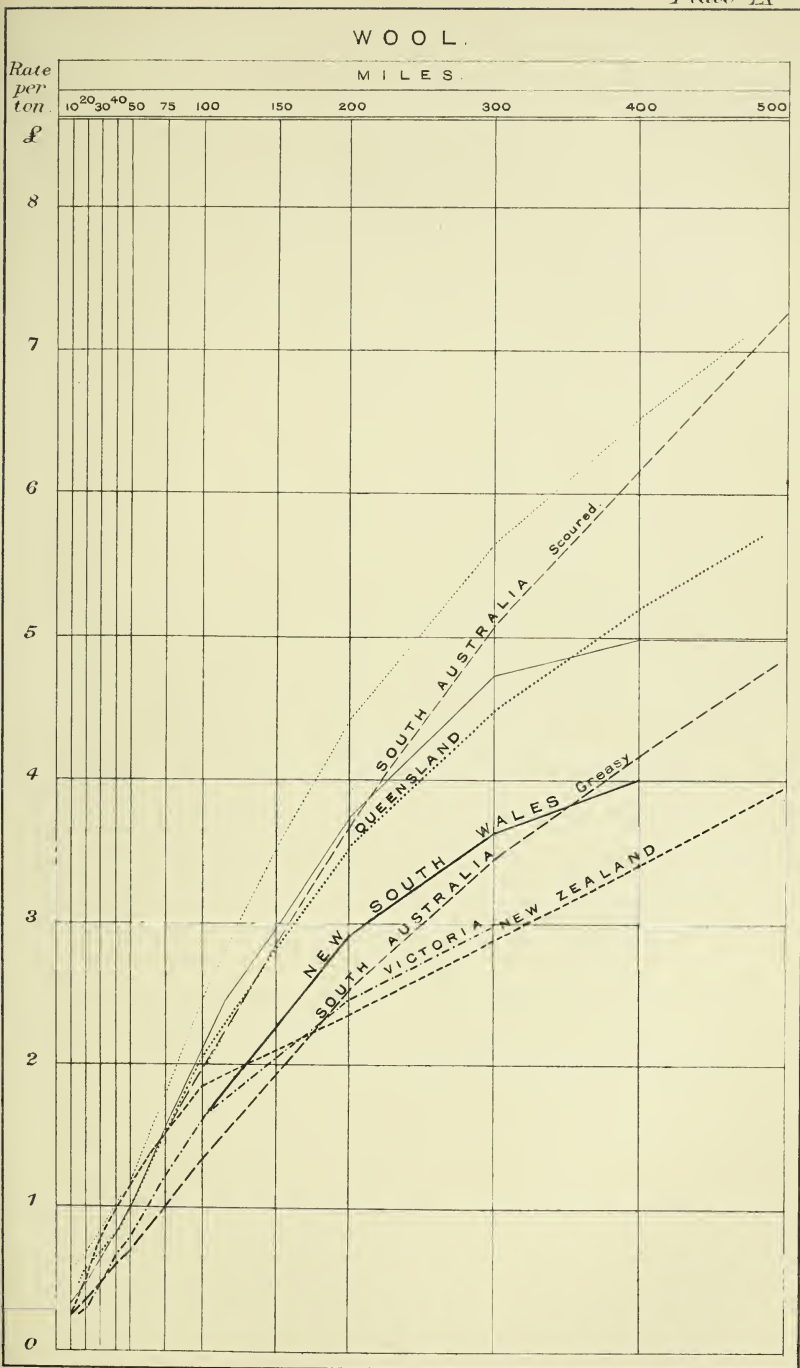


ORES.

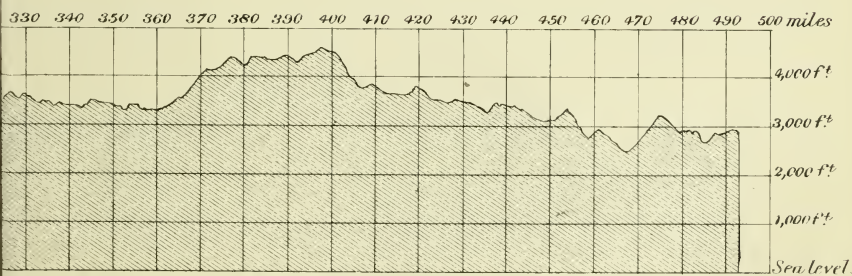
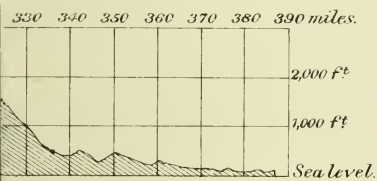


LIVE STOCK.



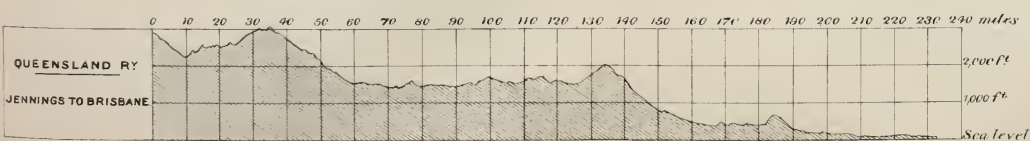
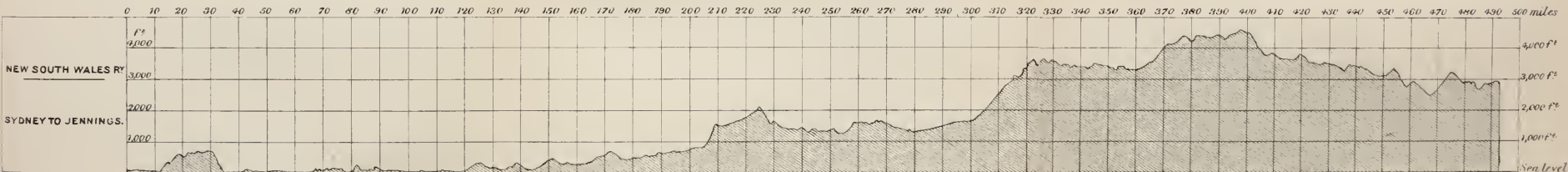
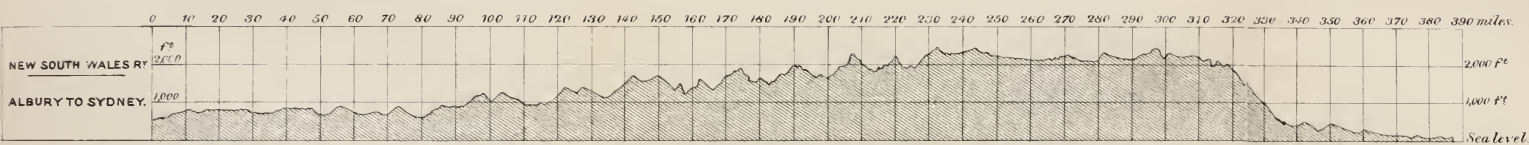
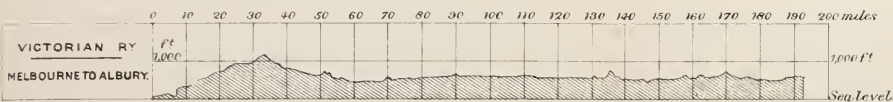
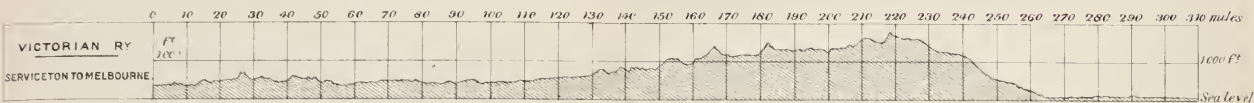
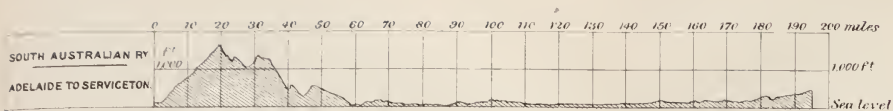


BRISBANE.



PROFILE OF GRADIENTS. ADELAIDE TO BRISBANE.

Plate X



DISCUSSION *on* MR. PRICE HOWELL'S PAPER.

MR. H. MONCREIFF PAUL said he could have wished that Mr. Howell had been present to read his own paper, as there was always a little delicacy in discussing a paper in the absence of the writer. This paper was full of interest, and worthy of much study, though perhaps it would have been better if, at the conclusion, the author had been able to make some sort of summary and let his readers know what results he had arrived at from the statistics he had so exhaustively worked out. There could be no doubt as to the importance of Australian railways. In a new country facility of transit was essential, not only for people, but much more for the products of the country, otherwise many so termed by-products would certainly lie waste, because they could not be economically transported to market. They were also the means of connecting various colonies together for strategic and other purposes. These Australasian colonies had manifestly not co-operated in the matter of railway construction. Some had gone ahead of others in the matter of construction of lines of railway and development of country. There was an additional reason why railway construction should be developed in those colonies in view of the desire now so generally expressed for intercolonial federation. For strategic purposes therefore it was most desirable that the main lines of Australian railways east and west and north and south should be developed as quickly as possible. That meant that colonies would be connected together, and in point of fact, that railway connection would pave the way for complete federation later on. The absence of a combined plan in the design of their railways was manifest from the want of uniformity in gauge, which ran from 5 feet 3 inches to 3 feet 6 inches. This was detrimental, because one could not travel from west to east without changing carriages. With regard to going from north to south that difficulty had to a certain extent been obviated, but much still remained to be done before the railway system throughout these colonies, setting aside New Zealand and Tasmania, would be what it ought to be. One could certainly travel from Adelaide to Melbourne without change of carriage on an uniform gauge of 5 feet 3 inches, but when one went from Melbourne to Sydney there was a break of gauge at Albury, which for military purposes would be a serious disadvantage. He fancied that heavy lines had been laid down in certain places where lighter lines would have sufficed, and hence a greater cost in construction had been incurred than was necessary. But of course it was easy to be wise after the event. Examining the cost per mile of railways in Australasia as a whole, including Tasmania and New Zealand, it was 9,617*l.*, New South Wales standing at 14,157*l.* and Victoria at 12,317*l.* per mile, and those two colonies represented the

largest portion of the existing railway system. If one looked to other countries in a somewhat similar position, one found that in Argentina the cost was 10,632*l.*, and in Canada 11,522*l.* per mile. But the salient feature in connection with Australasian railways was that they were not self-supporting. The gross earnings for 1896-97 might be taken in round numbers over the colonies at 10,200,000*l.*, while the working expenses were say 6,000,000*l.*, leaving the net earnings 4,200,000*l.* Now the money which had been borrowed and applied to the making of railways in those colonies might be taken in round numbers at 135,000,000*l.*, and the rate of interest payable upon it at approximately 4 per cent. The returns of the railways were but $3\frac{1}{4}$ per cent., and therefore there was an annual average loss of $\frac{3}{4}$ per cent. on the capital expended. So that the theory held by the various Governments that their railways should be self-supporting had not been carried out. There was a further difficulty in connection with these railways. The statistics of New South Wales and Victoria in the Commissioners' report on railways, showed that there was spent on the construction of non-paying branches in Victoria 14,000,000*l.*, and in New South Wales 8,500,000*l.*; the revenue of these branches being respectively 529,500*l.* and 313,800*l.*, whilst their working expenses were 363,700*l.* and 275,000*l.* The annual interest payable by the former was 515,000*l.*, and by the latter 338,800*l.* leaving a net loss in the former case of 349,200*l.*, and in the latter of 300,000*l.* Lines were sometimes built at public expense for the benefit practically of local landowners and speculators, who, in order to enhance the value of their property through the medium of powerful friends, and by the exertion of special influences, succeeded in securing the development of railway lines over the lands owned by them. Such lines being constructed in districts where the traffic was inadequate, did not pay, and the finances of the colonies in consequence suffered. The plan originally adopted should have been to take care of your trunk lines first, and leave the branches till later on. It must not be forgotten that the cost of construction of railways depended very much upon the time at which the work was executed, because the cost of materials and of labour varied. When the Australasian colonies in past years got their money very easily from John Bull, that money was at once sunk in railway plant and construction without regard to the market conditions prevailing at the time. Wiser counsels had prevailed of late years, and the cost in Western Australia was very much less per mile than in the other colonies he had mentioned. In one part of the paper it was remarked that Victoria carried a good deal of New South Wales' produce, taking it to Melbourne instead of to Sydney. This was not due solely to the proximity of the former to the Murray River, as stated by Mr. Howell. On this point a little more explanation should be given. There was a certain portion of New South Wales situated to the north of the Murray, and called Riverina. This district might be said to be one of the best jewels in her crown, but it was very much developed by Victorian men, who, from some change in the Victorian land laws thirty-five to forty years ago, were, so to say, driven across the

Murray and so developed Riverina. Their purse-strings were, however, held in Victoria, and therefore their produce went thither. Victoria at that time had tapped the Murray River by two railway systems to the north at Echuca, and to the north-east at Albury. Consequently those Victorians who went to live in Riverina had the opportunity of carting their wool to the Murray at Echuca and Albury, whence it was carried by the Victorian railways to Melbourne for sale or shipment. It was some time before New South Wales awoke to this fact, and she then found that a great deal of the traffic which might have been attracted to Sydney was diverted to Melbourne. The former has found it to be very difficult to regain the trade thus lost, and although the difference in mileage between Riverina and Sydney and Riverina and Melbourne was inconsiderable, Victoria, being first in the field with her railways, has, as regards Riverina, continued to reap the benefit of her diligence.

Mr. W. M. ACWORTH said there was one thing for which they might all be grateful to the Australian colonies, and that was the excellence of the statistics that the colonial railways gave, as compared with the exceedingly jejune materials for knowing what their railways did which they had in England. Of course there was a good deal more one would like to get. Some of the railways gave ton-mile statistics, and others did not, and it was almost impossible to compare one line with another without these figures. But at least all the different colonies published graphic statistics, showing year by year the increase or decrease in each individual important class of traffic; first and second class passenger traffic, wool traffic, hay, straw, and so forth, which brought out the facts in a way that they never got in this country. The last speaker referred to the question of gauge, and he wished the paper had mentioned how that question stood at the present moment. He noticed in a recent report of New South Wales, that the Railway Commissioners of that colony had hopes of getting a uniform gauge all over Australia in the near future. Of course if there were a uniform gauge it would be that of New South Wales, so perhaps they were naturally a little sanguine upon the subject. Another point on which he wished something had been said, as it was more important than any other to the English people, was the method of management. Of course it was not strictly statistical, but it would not have been foreign to the scope of the paper if they had had some account of the comparative success or failure of the different attempts that the Australian railways had made to keep the politicians, so to speak, at arm's length. It always seemed to him that the amount of independent power that the Commissioners were allowed, and the extent and methods of the limitations enforced or attempted to restrain or prevent the day-to-day interference by members of the Legislature for *political ends* with railway management, was the most interesting thing in connection with the Australian railways. It interested him very much to read the passage in which the author said he could not fail to recognise the efficient manner in which

the colonial railways were conducted. No one would wish to challenge that statement put in that broad shape; and he quite agreed with Mr. Price Howell that it was impossible to compare Australian railways with the railways of the United States as a whole, but he thought it would be very interesting, and not without value, to compare the Australian railways with a group of railways in the United States with which they were fairly comparable. He would take the group of railways which were classed in "Poore's Manual" as the south-western group, including the States of Missouri, Arkansas, Texas, Kansas, Colorado, New Mexico, and the Indian and Oklahoma territories, roughly speaking, the country west of the Missouri and south of Denver, down to the Mexican frontier, but excluding California. As far as one could judge, that district was fairly comparable in various ways with Australia. There was a very sparse population, for there was only one town in it at all as important as either Melbourne or Sydney, namely, St. Louis, which was situated on the eastern border of the district, and had a population of about 70,000. Now he found that Australia had 12,000 miles of railways, whilst this district, with a pastoral population and an area of only three-quarters of a million of square miles, as against four times that in Australia, had 35,000 miles. Roughly, the population was about the same, five millions in America as against four and a quarter millions in Australia. Yet there was three times the railway mileage in America. With regard to the relative economy with which the lines were constructed, the Australian lines were more than half narrow gauge and yet cost 9,500*l.* a mile; whereas the lines in the Texas and Kansas district had cost nominally 11,000*l.* a mile, but were all normal gauge. But this 11,000*l.* a mile was only the nominal capital. It was generally admitted that the half of the capital, which was represented by bonds, say, 6,000*l.* a mile, was quite as much as those lines actually did cost to construct. So that the Australian railways did not seem to show that economy in construction cost which might naturally have been expected to result from their money being raised on the credit of the Government. It might be thought that the construction of the American lines had been much less substantial. But that these railways had been fairly efficiently constructed seemed to be vouched by the fact that they had proved capable of carrying a vastly greater traffic than the Australasian lines. The Australasian lines carried about ten million tons, while this group of American lines carried forty millions, and of course there could be no question that the distances carried in Kansas, Texas, and Colorado would be on the average much greater, so that there was more than four times the actual amount of work done. He had not the passenger figures, but probably they would be considerably bigger in Australia, because around Melbourne and Sydney there was a considerable suburban traffic, which ran up the number of individual passengers. The other point on which a comparison would be useful was that of the rates. He thought there was no question that the Americans carried a great deal cheaper than the Australians. Some of the Australian figures quoted in the paper seemed extra-

ordinarily high judged by European standards. At any rate, the rates could not be claimed to be exceedingly low, whereas the rates in the American south-west group, considering that they were carrying for a comparatively sparse population, were exceedingly low. The average rate for passengers was 2·34 cents, or less than $1\frac{1}{4}d.$, which was probably lower, and the average freight rate was 1·15 cents, or a little over a halfpenny, which was undoubtedly much lower than the average rates of the Australian colonies. Of course no comparison went entirely on all fours, but on the whole the evidence seemed to him to indicate very distinctly that, granting the State railways of the Australian colonies to be efficiently conducted, the private railways of America must be vastly more efficiently conducted.

Mr. P. DE JERSEY GRUT said he should like to ask whether the last speaker had taken into account the net returns of interest on capital made by the group of American railways to which he referred, because that was a very important consideration. Many of the American railway companies practically went out of existence after a time; they went into the hands of a receiver, and the capital invested in them partly or wholly disappeared. A comparison could hardly be fairly made between them and Australasian railways, which were in the hands of Governments, and had to be carried on whether they paid or not, while the capital invested in them never disappeared from the debtor side of the national balance sheet. There was another point which he had never seen treated by writers on this side, in connection with one very important aspect of Australasian railways, and that was that there were in those countries enormous Crown estates. It was a case where the landlord, in fact, wished to improve his property, and it was most important that he should do so, because it increased not only its saleable value, but its rental. In the Australasian colonies the land revenue amounted to not much short of five millions sterling per annum, and they looked forward to its increasing with the increase in population. That was a most important aspect of the policy of the Governments in pushing forward railways, a policy the avowed object of which was to promote settlement by increasing the attractiveness of the land. The gentleman who first spoke alluded to the fact that a very considerable number of branch lines paid very badly; in some cases they did not pay their working expenses, and that unquestionably was a feature which suggested adverse criticism, but at the same time it must be considered from the point of view of public policy referred to. In Queensland, for example, they had about 428,000,000 acres, of which only about 14,000,000 had been sold. The vast proportion of the land was still Crown property, and it was of great importance to the community as a whole that that property should be improved and developed. They were content, at least to some extent, to make even a loss on their railway revenue, or at any rate that it should not cover the expenses and interest, provided that their land revenues not only made up for the deficiency but a great deal more. The proprietor of a

vast estate might be quite content to make a loss on his department of communications, provided that, through the facilities he afforded thereby, he made considerably greater profit on his rentals and sales, and laid the foundation for increased traffic. That was the most important aspect of the case, but it was not referred to in this country in criticisms on Australasian railways. Again, the net return, after paying expenses, came to about $3\frac{1}{4}$ per cent. on the capital expended. That was not a bad return, and he should be very glad to know whether the group of American railways which had been referred to returned $3\frac{1}{4}$ per cent., taking into account not only the companies at present existing, but also those whose capital had been swept into the abyss of insolvency. If all that capital were added to that which might be considered still to be live capital, he should very much doubt whether they returned $3\frac{1}{4}$ per cent. Although it was perfectly true that the net returns from these railways in Australasia was $3\frac{1}{4}$, and the rate of interest they paid on their loans was nearly 4 per cent., it should also be remembered that the borrowing rate they were paying was being continually reduced. During the last week three Australasian loans had been floated, chiefly for the purpose of paying off previous loans at a higher rate of interest, and these loans were obtained at a shade over 3 per cent., so that, in fact, a return of $3\frac{1}{4}$ per cent. from the railways more than paid the interest at rates at which they could now borrow, and although the average rate on the money borrowed over a considerable past period amounted to nearly 4 per cent., still, as those old borrowings matured and were replaced by loans at a lower rate, the railways could pay their interest. The Governments might also look forward, with an increase of population, to better returns from the working, so that in the future they would be in a much more satisfactory position than they had been in the past.

Sir JULAND DANVERS, K.C.S.I., said the first thing that struck him while hearing the paper read, was the want of uniformity in the various accounts rendered. This made the process of examination and comparison very difficult, and the writer, while giving much useful information and furnishing facts which were interesting, was unable to draw conclusions which would be as instructive as he could wish. This he frankly admitted in his paper, and it was to be regretted that the railways were not under the supervision of such a department as the Chairman (Sir Courtenay Boyle) represented. The unit necessary for statistical comparisons was that derived from the number of tons and passengers carried one mile, and their cost. It was to be hoped that Mr. Price Howell would use his influence to obtain such returns. If they were furnished by all the different railways, they would enable a judgment to be formed of the economy exercised in the management on various systems. Useful comparisons could thus be made between railways in Australia and with those in other countries. They would also furnish a safe guide for remunerative rates and fares. Average receipts per mile of line were of little use for these

purposes, but to know the average cost and receipts per ton of goods and passengers per mile was invaluable.

Mr. MATTHEW MACFIE said that, having been resident for five or six years in Australia, and having been at the head of one of the leading newspapers of Melbourne, he was brought considerably into contact with the political and economic bearings of the railway system of the Australasian colonies. He particularly admired not only the fulness and accuracy of the views expressed by Mr. Moncreiff Paul, who also had had the advantage of residence there. In one or two incisive remarks he seemed to hit the blot which affected the whole railway administration in that country. It was obvious from all that had been said in the paper and in the discussion, that the Australasian railways did not pay, taking them as a whole. He must say New South Wales seemed to be making progress, at present, in this department of the public service, probably in consequence of having had for some years a very efficient railway commissioner, who was entitled to a great deal of commendation for the manner in which he had performed his duties. No serious objection could be made to the manner in which the trunk lines had been constructed as a rule, whether as regards the route followed or the cost of construction. The great trial of the patience of the Australasian taxpayer was the making and unprofitable working of many of the branch lines. He was sorry to be obliged to say, as the result of his own observations, speaking as charitably as he could, that during his stay in Victoria, the making of branch lines in that colony was very largely influenced by political considerations. The course of events was generally this: The representatives in Parliament naturally desired to conciliate their constituents by conferring benefits upon them at the cost of the State, and usually the making of branch railways was one of the conditions upon which re-election of members of Parliament was guaranteed and the party in office kept in power. Influence was brought to bear on the Colonial Treasurer of Victoria, by parliamentary supporters of the Government, to grant the requests of their constituencies. When Mr. Gillies filled that office in 1892 he was perpetually embarrassed by the approaches of suburban members, and at last was brought to a stand before the House in consequence of the numerous demands made by rural representatives for branch lines. One night he astonished the House by saying that the appeals which had been made to him, within a few months, would bring the total new loans required to build the railways solicited up to 22,000,000*l*. Following upon this announcement he determined to take no further steps in the matter until a Committee of inquiry had been appointed by the House to go into the whole question. That Committee was appointed, and conducted its labours for a series of months. The result of the investigation was the discovery made by the Committee that a large number of railways had been made in the colony which could not by any possibility pay until most of the honourable gentlemen then in Parliament were in their graves. The money with which so

many unremunerative lines were constructed had been obtained between 1885 and 1889, when the colonies were in high credit in this country, and the local banks were overloaded with deposits on Government account—the proceeds of British loans—which were waiting to be employed in making these lines. Several local railways of the most superfluous character were made around Melbourne, apart from the rural districts, and that accounted to a very large extent for the preposterous deficiencies in the railway income from year to year ever since. No doubt, as had been stated, there had been, in recent years, a reduction in the rate of railway expenditure, but that by no means compensated for the extravagant outlay on the existing lines, and he was sorry to have to accentuate what Mr. Moncreiff Paul had said. One of the serious difficulties was the suddenly increased value of the land, when it leaked out that the Government had decided to make use of it for railway purposes. Members of Colonial Parliaments sometimes utilised the early knowledge they were able to obtain of the intentions of the Government to acquire lands which they knew would be required for railways. In one instance, which he had in his mind, a large fortune had been made in this way. The high rates which had to be paid for the lands, as well as the paucity of traffic in sparsely populated districts, largely accounted for the difficulty in making the railways pay. He thought the root of the evil with regard to the railway system in Australia was first of all that it was a Government system. That question had not been touched upon, but it was a very suggestive question, more particularly as there was a movement in this country in certain quarters for the transfer of railways to the Government. In his opinion it was a choice of evils, but he ventured to think that the methods pursued in the United States, with all the drawbacks of private ownerships of lines, would seem to afford a better guarantee, in the long run, for the healthful development of commercial facilities, than the placing the railways of the country in the hands of the Government. He was strongly of opinion that there was nothing better for a politician in this country, who wanted to know the dangerous tendencies of State socialism as affecting railway and other kinds of property, than to reside for a time in the Australasian colonies, where it was to be feared socialistic experiments were carried to excessive lengths.

The CHAIRMAN (Sir COURTENAY BOYLE, K.C.B.) said in estimating the application of figures to railways, as to any other form of commercial machinery, regard must be had to the object with which the railways were started. Not very long ago, not with regard to this country or to Australia, he asked a gentleman what he thought the objects of light railways were? The reply was, that the principal object was to take his goods over somebody else's land, at somebody else's expense, to somebody else's market. That, he imagined, was not the intention with which the railways were constructed in Australia, and certainly not in this country. He had been very much impressed by the observations of Mr. Grut and Mr. Macfie, who had pointed out that railways in Australasia

were constructed not merely with a view to an immediate financial return, but with the object of developing the colony, and that was an object which would commend itself to all concerned in the administration of those great colonies. It was to some extent the policy followed by our great railway companies in this country. They had not regarded solely the immediate return from a particular line they were desirous of constructing, but had also regard to its effect on the whole of their system. In the same way the Governments of the colonies in Australia did not consider the question simply with regard to the immediate pecuniary return, but were actuated by considerations affecting the development of the colony and the improvement of the means of communication. They might be quite sure that in the long run, if the railways were wisely constructed, returns must come from increase of population, and consequently of traffic. References had been made to the difficulties which the Governments had in constructing branch lines, but he could assure Mr. Macfie that our big railway companies in this country had suffered from very similar difficulties. It had leaked out where a railway was going to be constructed, and some kind friend often went and bought the land. It was not an exceptional case at all, the only difference was that in Australia the Government had to pay, because the Government owned the railway, and in this country the shareholders in the company had to pay. As a Government officer, he was very glad to hear what Mr. Macfie said about the State management of railways. He attached the greatest possible importance to the individual enterprise and the great knowledge and zeal with which the great companies of this country managed the railways. Perhaps he ought to say that if the Government managed them they would do it a great deal better; but he was not quite certain that he could substantiate that proposition. With regard to the methods on which the statistics had been compiled, Sir Juland Danvers and Mr. Acworth both showed that yearning that they all felt for the ton-mile. He had been yearning for it for the last fifteen years, and he supposed he would have to go on for some years longer. All the railway companies expressed their utter inability to give the ton-mile. They said that in England a large train carried articles of very different value for various distances; in the same train you might find lace and petroleum, pianos and matches. How were you to estimate the cost of conveying those various articles for a particular distance? That was the answer that always came when they asked for the ton-mile. He was sorry to hear that Mr. Acworth was still dissatisfied with the statistics the Board of Trade furnished for him, but when he said the figures in the paper were infinitely superior to those furnished for home consumption, he should like, without at all quarrelling with him, to point out that in one place they were told that in some of the colonies at least it was impossible to make a distinction between passengers and goods per train-mile. At any rate in England they gave the difference between passengers and goods trains. The figures, as far as they were quoted in the paper, showed that the lessons learned in Australia were the same as those learned here, namely, that there

was always a temptation to put upon the short distance traffic as much as that traffic would bear, and to take off from the long distance traffic as much as could be taken off. If the railway managers, whether Government officers or his friends of the London and North Western or Great Western Railways, did not adopt that principle they would find very great difficulty in getting any long distance traffic at all. Another thing he found running through the statistics was that the opening of new railways (if they were wisely conducted, and if the temptations Mr. Macfie had referred to were sternly resisted) always led to an ultimate development of traffic. The more you wisely increased railways, even in this thickly populated country, the more the traffic grew. More than that it had been proved over and over again that the greater the facilities the railways gave to the public the greater would the returns be. There were several other lessons to be drawn from the paper, but he would not detain the meeting any longer except to move a most cordial vote of thanks to the writer of the paper, which would be conveyed to him by the secretary.

In other words, a £10 tenant-at-will clause would add just 40 per cent to the existing countituencies, and a £20 clause only $17\frac{1}{2}$ per cent. If a *rating* franchise in lieu of a rental one were adopted for the counties (of which there is some intimation), a £10 limit would add about 230,000, and a £15 limit perhaps 150,000. But this is conjectural. It is understood that a savings bank qualification is to be introduced, and some returns have been presented to Parliament along with the electoral statistics, to enable us to judge of the effect of such a proposal. From them it appears that a qualification based upon the having had £50 in a savings bank for one year would give the franchise to 97,000 adult males. If two years were required, the number would be only 87,000. In either case about 30,000 of these would, it is estimated, belong to the working classes. Now the facts developed in these tables are remarkable; and it is still more remarkable that they all point in one direction. The following conclusion from them seem irresistible, unexpected as they are:—1st. That the electoral franchise is gradually extending itself by a natural operation, and on the whole at a pretty rapid rate—much more rapidly at all events than the population. 2nd. That already *one-fourth* of the entire borough constituency of England and Wales consists of working men, and in several towns considerably more. 3rd. That a £6 rating or an £8 rental qualification would apparently add about 25 per cent to the existing number of borough electors, and that most of these new men would belong to the working classes; so that in some towns either measure would give the *command* of the representation to those classes. 4th. That a £50 savings bank franchise would admit nearly 100,000 electors, of whom *one-third* would be working men.”

The following is a return of the male occupiers at specified rentals :

			Rental.	Rateable Value
Male occupiers at £4 and under £5.....			108,405	177,530
“ 5 “ 6.....	5	“ 6	131,762	135,634
“ 6 “ 7.....	6	“ 7	130,293	49,939
“ 7 “ 8.....	7	“ 8	94,044	60,617
“ 8 “ 9.....	8	“ 9	69,147	65,268
“ 9 “ 10.....	9	“ 10	43,209	43,612
“ 10 and over.....			639,043	530,585

To the rateable value column should be added the occupiers at £6, amounting to 55,666, which would make the number at £6 and under £7, 105,605.

The return for the counties is as follows:—The number of male occupiers of a house or other building with or without land in counties was at the rateable value of £10 and under £12, 47,268; at £12 and under £15, 53,885; at £15 and under £20, 60,903; at £20 and under £50, 125,489. Total at £10 and under £50, 287,545; at £12 and under £50, 240,277; and at £15 and under £50, 186,392. The number of electors on register 1864-5 as £50 occupying tenants was 116,860; the number of male occupiers at gross estimated rental of £50 and upward was 155,847; and the total number of electors on register 1864-5 was 542,633. The population of counties in 1831 was 8,689,277, and in 1861, 11,427,655.

Regarding Birkenhead, Chester, Manchester, and Liverpool, the following statistics are given: Birkenhead: Voters, 4,563; actual number of persons who were under description of mechanics, artizans, and others,

supporting themselves by manual labor, 2,065. Chester: Voters, 2,274: £10 occupiers, 361; freemen, 653; mechanics, artizans, &c., supporting themselves by manual labor, 987. Liverpool: Voters, 20,618; £10 occupiers and freemen, or scot and lot voters, Potwallers, or other ancient right qualifications, 381; mechanics, artizans, and other persons supporting themselves by manual labor who have a vote, 2,680. Manchester: Voters, 21,542; mechanics, artizans, and other persons supporting themselves by manual labor who have a vote, 5,822.

In table A we find that the population of the boroughs in England and Wales in 1831 was 5,207,520. In 1865-6 it is estimated at 9,326,709, showing a net increase of 4,120,000. The total number of electors on the register of 1832-3 was 282,938; in 1865-6, 514,026, including double entries; but not including double entries, 488,920. The net increase of electors on register is 231,628. The number of electors who voted at the last general election was 280,793, including in some cases the votes recorded, when the number of voters could not be given.

It also appears that the total number of freemen on the register 1832-3 was 63,481; on the register 1865-6, 41,041, showing a decrease of 21,840. The total number of scot and lot voters, &c., in 1832-3, was 44,738; their number now is 7,837, a decrease of freemen, scot and lot voters, &c., is 57,741.

As to the number of electors coming within the description of *mechanics, &c., supporting themselves by daily manual labor*, there are 108,298 among the £10 occupiers; 20,018 among the freemen; 2,348 among the scot and lot voters—the total being 130,664. Deducting 2,061 for those who are on the register in respect of more than one qualification, the actual number of electors who come within the description is 128,603.

In the borough of Liverpool the gross estimated rental in 1853 was £1,680,824; the present, £2,655,838, showing an increase of £975,064. The rateable value in 1856 was £1,527,831; the present £2,402,584, showing an increase of £874,753. The number of male occupiers was at a gross rental of under £6, 1,385; £6 and under £7, 3,152; £7 and under £8, 5,245; £8 and under £9, £5,925; £9 and under £10, 4,737; £10 and over £40,079.

THE IMPERIAL MEXICAN RAILWAY.

Whatever may be said for or against the existing Imperial Government of Mexico, considered in the light of political philosophy, one thing at least the practical good sense of mankind will sooner or later credit it with; that it has been the first government ever established in Mexico which has extended a systematic and efficient protection to great works of internal improvement.

The question whether the true and lawful Republican authority in Mexico resides in the person of Benito Juarez, at Chihuahua, or in the person of Gonzales Atega, at El Paso del Agnila, or in the person of General Ogazon, at some point just now not clearly ascertained, is one which we do not profess to discuss. But the fact that the current month of June is destined to witness the opening of nearly one hundred miles of railway communication between the City of Mexico and the Junction of Apizaco, on the way to Puebla, is, to say the least of it, quite

as important to the commerce and the interests of mankind ; and it is but fair to the capitalists and the contractors who, acting under the authority of Maximilian, have achieved this result, that some notice should be taken in foreign countries of the resolution and the skill with which they are pushing forward to completion the first grand steamhighway of Mexico.

The "Imperial Mexican Railway Company" was formed in September, 1864, for the purpose of carrying out the project of a direct communication by steam between Vera Cruz and the capital, originally conceived, many years ago, by one of the few really enterprising natives of Modern Mexico, the late Don Manuel Escandon. The project of Escandon was arrested in its development by the fearful political condition of the country. Since five Presidents during the ephemeral rule offered the project a support which they never made good ; and when the present company was formed, under the auspices of the Empire, there existed in Mexico only about fifty miles of railway, divided between the State line, which running out of Vera Cruz terminated at La Soledad, at which place the famous convention of 1862 was signed between Juarez and the European Allies, and the still shorter line which, running out of the City of Mexico, terminated at Guadalupe, the "sacred mount" of Mexican Catholics in the Loretto of the Indian populations in and around the capital. A beginning had thus been made at both ends, but between there intervened a vast distance of nearly 300 miles, over which the most important traffic of the country, between its chief city and its most flourishing seaport, had to be carried on over an ancient and dilapidated Spanish road, climbing mountains and sinking into gullies, and so tremendously difficult of travel, even by the heavy wagons and the indefatigable mules of Mexico, that the average cost of transportation from Mexico City to Vera Cruz has long ranged in the neighborhood of *forty dollars* per ton. That, in spite of these difficulties and the enormous consequent expense, a constant demand existed at the City of Mexico for the costliest and most varied cargoes of European and American goods which could be imported into Vera Cruz, was a sufficient argument of the results possible to be achieved by the construction of a through line of railway. This, with other arguments, being urged in London by the leading capitalists of Mexico, the "Imperial Mexican Company" was finally formed at the time we have mentioned above ; the Government of Maximilian offering protection to the roads, and a handsome contribution towards defraying their cost. The contracts for building the road, 300 miles in length, were given out originally to Smith, Knight & Co., of London, by whom they were afterwards transferred to Crawley & Co., another well-known English firm. The line of the proposed road was surveyed and laid out throughout its entire length by one of the most distinguished of American railway engineers, Col. Andrew Talcott, and on the 13th of February, 1865, Mr. Wm. Lloyd, the experienced constructor of the most difficult mountain railways of South America, acting as Director-in-Chief under the contract with Messrs. Crawley & Co., made a commencement of the railway at the point of greatest difficulty, near the Cumbres, or mountains of Boca del Monte.

The road at that time had been carried on from La Soledad to Paso

del Macho, a point 65 miles distant from Vera Cruz, at which, during the last year, a small town of more than 2,000 inhabitants has sprung up, with schools, hotels, a railway station, and all the other evidences of a state of progress and civilization which we find germinating along the path of the railway in the expanding regions of our own Western domain.

To appreciate fully the progress made since that date, of which progress the opening of the line between Mexico and Apizaco is the immediate and striking proof, it is necessary for the reader to bear with us while we sketch out for him hastily the enormous, the literally enormous difficulties in the way of this gigantic railway enterprise.

As the crow flies, Mexico City lies at a distance of about 200 miles from Vera Cruz. But while Vera Cruz is seated on the edge of the ocean, Mexico City is situated on a height of no less than 7,340 feet above the sea-level. Had it been found practicable to build a railway of uniform ascent from Vera Cruz to Mexico, therefore, it would have been necessary to give that railway an ascending incline of no less than $36\frac{1}{2}$ feet per mile, a piece of engineering work which might well appal the inexperienced and give the most experienced "pause." But even this was not practicable. Between Vera Cruz and Mexico a point must be passed much higher than the elevation of Mexico itself. The country which intervenes between the two may be described as made up of two great plateaux, united by an inclined plane—the lower plateau averaging about 700 feet, and the upper about 8,000 feet in elevation above the sea-level. Between these two plateaux is a distance of about fifty-five miles, which distance is broken up into lofty and rugged chains of mountains called in the country Cumbres, which form the eastern flank of the upper plateau. The width of the lower plateau itself is just about equal to that of this intervening space, or fifty-five miles; and consequently, the ascent to the level of the upper plateau had to be accomplished within a distance of 110 miles from the coast, a feat absolutely without parallel in railway experience, and the proportions of which will be more fully comprehended when we remember that in traversing the lower plateau which takes the road over one-half this distance, or fifty-five miles, the engineers reach an elevation of only 1,500 feet, leaving them to master a further elevation of nearly 7,000 feet within the succeeding 55 miles to the crest of the Cumbres above spoken of.

Here, then, was the problem of the railway, to accomplish an ascent of 6,540 feet in 55 miles, corresponding to 119 feet per mile, or two feet in $44\frac{1}{2}$ feet throughout the whole distance.

The following table of the severest ascents heretofore known in railway engineering will give the most accurate idea possible of the task imposed upon Colonel Talcott and M. Lloyd.

Ascent.	Incline.	Railway.	Feet per mile.
The Giovi	Turin & Genoa, Italy.....	147 for 6 miles.
The Semmering	Vienna & Trieste, Austria.....	113 for $13\frac{3}{4}$ miles.
The Chanarcillo	Copapo, Chili.....	196 for 13 miles.
The Tabon	Valp. & Santiago, Chili.....	120 for 12 miles.
The Alleghany	Baltimore & Ohio, U. S.....	117 for 11 miles.

But even these figures do not fully set forth the extraordinary nature of these great works in Mexico; until we take into the account that whereas the most abrupt ascent ever before achieved, that of the

Chanarcillo on the Copiapo line in Chili, is of 196 feet in 13 miles, the chief incline of the Imperial Mexican Railway at Maltrata near Orizaba will overcome 211 feet per mile in a distance of 23 miles. In achieving this part of the works, the engineers have been called upon to construct over the river Metlac, midway between the cities of Orizaba and Cordova, a viaduct which, when completed, will surpass any structure of the kind now existing in the world, and will, of itself, be well worth a trip to Mexico to see. This viaduct, to consist of an iron bridge, now constructing and nearly completed in England, will carry the road over the Barranca de Metlac, at the enormous height of 380 English feet being nearly 150 feet higher than any such work now extant, so that it, would be possible to pile upon the spire of Trinity Church the spire of Grace without reaching the roadway sustained upon its magnificent arches.

Some notion of the strictly engineering difficulties of the work undertaken by the Imperial Mexican Company, and to be completed, according to the terms of its contract with Crawley & Co., before the 30th April, 1869, may be derived even from these brief statistical notes. But when the reader reflects further that all the most important materials, the rails, the working tools, many of the supplies for the great bodies of workmen to be employed on the line, not only up to these heights of the Cumbres, but far beyond them upon the upper plateau, stretching from the Cumbres by Puebla to Mexico, must be imported from Europe and America, and transported hundreds of miles on the backs of mules, or in the wide broad-wheeled wagons of the country over the most execrable roads on earth, he will readily agree with us, that when the Imperial Company in June, 1866, can point to more than 160 miles, or over half their whole line opened to commerce, they may fairly claim to have accomplished as handsome a year's work as men need be called upon to do. In accomplishing this, the Company have expended, for example, more than a million of dollars upon the transportation of rails alone from the coast to the line on the upper plateau. They have employed, and now employ, a total force in all departments of about 10,000 persons; they are receiving rails and other materials in the port of Vera Cruz at the rate of about 2,000 tons per month. England having recognized the *de facto* Imperial Government at Mexico, the vast business connected with this enterprise, which naturally and under ordinary circumstances would have inured to the benefit of American industry and capital, has, of course, been chiefly carried on the profit of Great Britain. American engineers are, however, employed under Col. Talcott on all parts of the walls, the difficult section of the Chiquihuite, on the edge of the *tierra caliente*, or tropical region, being under the charge of Mr. Deckert, of Pennsylvania, an engineer who has learned in Cuba to make light of the *vomito*, and to keep a cool brain under the hottest suns.

The opening of the upper sections between Mexico and Otumba, and Otumba and Apizaco, will give an immediate impulse to the intercourse between the two great cities of Puebla and Mexico, and to the development of the extensive intervening country. In conjunction with the lower section, already in operation between Vera Cruz and Paso del Macho, passengers from Vera Cruz to Mexico will thus be enabled to make their journey in two days, instead of three, and light goods,

which now require three weeks in the transport, will be forwarded in six days. Such a consummation may truly be regarded as a great and glorious victory won for civilization and true progress in Mexico. Whether under the banner of an Empire or the banner of a Republic, the "road-maker" is the true benefactor of nations, the true precursor and prophet of liberty, and all good things which come with liberty, wisely understood and wisely practiced.

SYSTEME METRIQUE.

MODERN commerce has encountered no greater obstacle to its progress than the multiplicity of weights, measures and moneys used in its prosecution. Not alone the great nations of the world, but every petty principality and power, until recently had their own denominations and values, differing greatly from one another and only translatable through the aid of voluminous dictionaries compiled from elaborate comparisons. Such a condition of affairs might be tolerated in the primitive eras of nations, before travel and national interchanges of products became the great business of the human race; but in the present era, when the railroad and steamship carry passengers and freight with the swallow's pace, and when the commingling of nations makes the world as a single brotherhood, something more simple and universal in its functions is demanded, which the denizens of each and every nation, however foreign to each other in language, can easily comprehend. The great want has been and still continues in a measure to be a universal system, with a nomenclature, founded on the ancient Greek and Latin, languages in universal use. The adoption of such a system was one of the first acts of the French Revolutionary government, which in 1799 proclaimed the *Système Metrique*. It has since been adopted either wholly or partially, and its use become permissive or obligatory in almost every civilized country. We ourselves have for many years used it in scientific processes, and are now about to bring it into general use. A bill to this effect is before Congress, and has already been sanctioned by the Representatives; and there appears to be little doubt but that the bill will finally become a law, and the system in a short time be popularized throughout the Union. The change demanded by the new system will come easier to ourselves than to nations wholly accustomed to multiply and divide by the binary process. We have learned the decimal mode of proceeding from our own money system, and hence to carry its application to weights and measures will soon become familiar. Otherwise than this, the change contemplated by the present law is without complexity, being simply the substitution of one unit of value for another. What follows will explain the whole subject.

HARMONY OF THE FRENCH SYSTEM.

Though decimal weights and measures will be new to this country, they are not new to the world. They originated in France three quarters of a century ago, where they have been fully tested in the crucible of commerce; and the system there adopted has been proved to be the best that it is possible for man, aided by science, to devise. In France it has had the best trial it is possible that it could have; for it is only in a country where

The following table, deduced from the above, exhibits the relation of capital, earnings, profits, &c., and the rates of dividend paid in the several years :

	1861.	1862.	1863.	1864.	1865.	1866.
Cost of road, &c., per mile.....	\$24,439	\$25,936	\$27,330	\$24,837	\$24,837	\$25,413
Earnings per mile.....	6,614	9,031	11,266	13,085	12,493	10,124
Expenses per mile.....	2,801	3,320	4,443	6,619	8,118	6,565
Expenses per cent.....	42.35	36.76	39.43	40.60	65.00	64.81
Net earnings per cent per mile.	3,813	5,711	6,823	6,466	4,375	3,559
Net earnings per cent.....	57.65	63.24	60.57	59.40	35.00	35.19
Net earnings to capital per cent....	13.85	19.79	20.02	19.03	12.75	10.54
Net earnings to cost, &c., per ct.....	15.60	22.02	24.99	26.03	17.61	14.00
Dividends per cent—cash.....	13	15	11	15	10	8
Dividends per cent—stock.....	..	5	20	..	..	..

The net earnings, as above, are the gross earnings less operating expenses, and before any deduction is made for taxes or other extraordinary accounts.

The market price of the stock of the company (range) for each month is stated below :

	1861.	1862.	1863.	1864.	1865.	1866.
January.....	92 @100	110 @110	147 @175	180 @180	170@180	110 @123
February.....	94 @ 94½	103 @110	155 @161	146 @157	150@160	114 @115
March.....	93½@100½	109½@113	158 @167	157½@175	130@150	111 @115
April.....	90 @ 95	112 @115	158½@160	165 @174	..	114½@115
May.....	91 @ 93½	112½@116½	160 @165	168 @168	130@ 95	114 @115
June.....	93½@ 97	119 @120	159 @161	167½@169	125@130½	116 @118
July.....	94 @ 98	113 @125	155 @160	149 @170	130@133	110 @113½
August.....	94 @ 95	118 @125	155 @155	170 @171	124@130	110 @111½
Sept'r.....	95 @ 96½	121 @125	150 @155	170 @170	125@128	111½@115
October.....	96½@ 99	132 @135	160 @160	164 @164	127@130	113 @115
Novem'r.....	97 @ 99	135½@138	155 @157½	170 @170½	127@130	111½@113½
Decem'r.....	100 @102	141 @145	163 @181	180 @182	125@127½	109 @112
Year	90 @102	103 @145	147 @181	146 @182	124@180	109 @123

INDIA RAILROADS AND THE COTTON TRADE.

The efforts recently made by the English Government to develop the resources of its vast empire in Hindostan, evince remarkable energy and sagacity. Probably no country in the world has made more material progress within the last few years than British India. Notwithstanding the discouragements arising from the mutiny of the Sepoys, and the disasters of famine and financial collapse, the present condition and future prospects of the people have been greatly improved. Railroads have been built, highways have been thrown up, canals widened and deepened, obstructions removed from rivers, bridges constructed over rivers and mountain chasms, and the jungle has been rendered passable for the first time.

These great changes in the condition of the interior of British India were initiated, or, at least, actively commenced in accordance with a policy adopted at the commencement of our civil war. England, in place of attempting to break up our monopoly of the cotton trade by an open and formal assistance of the South, resolved to effect the same object by other and surer means. Her statesmen, with far reaching sagacity, resolved to improve the opportunity afforded by the American crisis, so as to attach the tottering Indian Empire to the imperial government by a bridge of gold. India has always been famous for cotton

manufactures of unrivalled fineness and elegance, and it was known that her climate presented admirable facilities for the culture of the raw material. Under the stimulus of high prices the whole world was invited to compete for the production of cotton. But special measures, as is well known, were adopted to develop its culture in British India, and for this purpose the wealth and experience of the English people and government were brought into requisition.

The opportunities were favorable. The Imperial Government had got rid of the cumbersome and obsolete machinery of the East India Company, and assumed direct control of the vast Empire of India. In 1860-61, the Marquis Dalhousie, Governor General, inaugurated the extensive system of internal improvement, which was to enable the people of Hindostan to compete with America for the cotton trade of the world. To effect this object great changes were required. The most favorable cotton regions of India were inaccessible for want of proper facilities for communication. In order to get the staple to a market, it was necessary to carry it by man and horse power over vast tracts of jungle, across mountains and ravines, and ferry it over great rivers.

To obviate these difficulties, the railroad movement inaugurated was of the most comprehensive character. The population of India subject to the English government is probably not less than two hundred millions. The country comprises an area of 1,364,000 square miles, stretching 1,800 miles in length and 1,500 miles in breadth from east to west. There is a coast line of 3,200 miles, of which 1,900 are on the Indian Ocean and 1,300 on the Bay of Bengal. The climate is tropical, but embraces every variety of temperature from the extreme cold of the Himalayan mountains to the warmth of the tropics. This great country is broken up into an almost endless geographical diversity. There are vast and impassable jungles, huge forests, mighty rivers, mountain chains and extensive plains, the whole being combined with a wonderful luxuriance of vegetation, which at every step obstructs progress and almost prevents any passage by man or beast.

It was over this country, presenting so many difficulties, that Lord Dalhousie contemplated his admirable network of railroads. The system was, of course, planned with reference to the geographical features of the country, so as to connect the extremes of the vast empire with grand trunk lines, from which branch lines, or feeders, might be constructed, according to the future requirements of local commerce. Four thousand six hundred miles of railroad were to be built, at an estimated expense of \$400,000,000. The credit of the Imperial Government was granted to private companies, guaranteeing a certain amount of interest on all money invested in Indian railroads. The government wisely left all details of construction and management to the energies of the companies themselves, which had every motive for economy, as all money earned above the guaranteed dividends was clear gain. This system worked so well, that last year several Indian railways exceeded the 5 per cent. guaranteed interest. During the half year ending December 31st, the East Indian and the Great Peninsular railroad companies were able to declare surplus dividends. Half the amount of surplus income was devoted to the repayment of former advances for interest by the government, and the other half was divided among the stockholders.

The net amount of guaranteed interest paid by the government diminishes every year. In 1865 the amount was £1,450,000; in 1866 it was £800,000, and this year only £600,000 was required. These figures indicate the profitable character of these Indian railroad enterprises.

The original system of Indian railroads contemplated the establishment of communications between Bombay, Madras and Calcutta, the three great centres of military and commercial power. The extremes of the empire were united, and roads were cut through the great agricultural and producing districts. The East Indian Railroad Company has now under its management 1,310 miles of railway, constructed at an expense of \$100,000,000, and is the longest line of road in the world under one company. The Great Indian Peninsular road will be 1,233 miles long when completed, and next year it will be open for traffic along its entire length. In 1868 from Calcutta to Bombay, a distance of 1,458 miles, there will be an unbroken railroad communication. The branch lines connecting with the main stems are of great extent, and will cost as much money as the main roads. To show the progress of Indian railroads it may be stated that it is only fourteen years since the first line was opened in that country. At the present time there are 3,200 miles in operation, and next year a thousand additional miles will be completed.

This development of railroads in British India is of the highest importance as affecting the cotton trade. Formerly we enjoyed a monopoly of the market; now, nearly one-half of the cotton manufactured in England is derived from India alone. A late Liverpool circulars estimates the quantity of American cotton now on hand and to arrive before December 31st, 1867, at 680,000 bales, while the supply of India cotton for the same period is estimated at 925,000 bales. Without expressing any opinion as to the correctness of these figures, the more important fact for us to remember is that the manufacturers of England have so altered and improved their machinery as to be able to use in much larger proportion than formerly the shorter India staple, while, at the same time, the quality of cotton from that country has been decidedly and steadily improved, and is being more carefully prepared for market. Judging then of the future from the past, it may be expected to equal the American article at no distant period.

The establishment of railroads in India removes the chief obstacles to the growth of an almost unlimited supply of cotton. The country is admirably adapted for it, and the teeming population has long been familiar with the staple, and exhibit great aptitude in its culture. The best cotton regions have not yet been opened to the world; the only facilities for reaching a market being the slow and expensive process of cattle teams. The new railroads, however, will convey the products of these regions to market cheaply and expeditiously. And it is a noticeable feature of Indian railroad companies that their revenues are derived from goods rather than from passengers. Of \$35,000,000 income of Indian railroads during the three years ending June, 1866, two-thirds were received from merchandise traffic.

These facts throw considerable light on the future of the American cotton trade. They indicate that American cotton will henceforth be subject to a keen and active competition. The cheapness of labor in India will

also tend to place us at a disadvantage, as it is doubtful whether the freedmen can work as cheaply as the Hindoo, who lives on a handful of rice a day, and whose clothing consists of a yard of calico a year. It is evident therefore that the trade in our chief staple will be subject in the future to new conditions that may seriously affect our entire country. In this view it is of the utmost importance that every facility should be extended to the cultivation of the staple in the Southern States, and that every obstacle should be removed. The injudicious cotton tax, that operates as a direct bounty to foreign production, should be instantly repealed, and new capital should be tempted into the production of the staple by the indispensable guarantees of security and political quiet.

THE GROWTH OF OUR CAPITAL AND INVESTMENTS.

In every country where a high degree of industrial activity and material prosperity prevails, there is continually going on an increase and accumulation of capital; and the laws by which that increase is governed have received some attention from political economists, though far less, probably, than their importance deserves. Of these laws, one of the best established is that the capital of any nation increases in proportion as individual property is protected by law and as safe remunerative investments are easily accessible to all classes of the community. In Mexico and some of the South American republics, property of all kinds being insecure, capital increases very slowly, if at all; and when the insecurity reaches a certain point, capital undergoes an actual diminution, and the country grows poorer every year. In England, on the contrary, and in this country, where the central principle of the laws rests on the security of person and property, and where the rights of capital are fenced round with all the safeguards which the wit of man can contrive, wealth grows very rapidly, and the increase of capital has surpassed anything ever realized in the history of modern nations.

Next to the security of property, one of the most important conditions for the increase of wealth is that good investments shall be easily accessible to all classes of men who have the ability, by frugal thrift and skillful industry, to amass a surplus above their wants. In this respect, for some years past we have had an advantage over other countries. It is true that our currency for three or four years after the commencement of the war, was being gradually inflated. But the effect of the redundant issue of paper money was twofold. It acted in favor of the poor and of the great masses of debtors throughout the country, by enabling them to pay their debts in a denomination of money of less value than that in which they were incurred; and what is of more importance for our present purpose, it gave that stimulus to all kinds of industry which an abundant currency among an industrious, energetic, ingenious, versatile people never fails to develop. The rapid, steady growth of wealth, and the extraordinary material prosperity which resulted astonished our political economists, because it was realized in apparent defiance of some of those general facts and laws which they had been accustomed to regard as equally stern and unyielding with the laws of gravitation. Notwithstanding that in the prodigious expen-

MOUNT CENIS SUMMIT RAILWAY.

The line of railway which has been in the course of construction for the last eighteen months over this pass, and which follows in the main the great road of the First Napoleon, was successfully traversed on the 21st ultimo over its whole length of 48 miles by a locomotive engine. A train composed of an engine and two carriages left the St. Michel station at 6:30 A. M. There were present the Duke of Vallambrossa; Mr. Fell, the inventor of the system; Mr. Brogden, a director of the company; Mr. Brunlees, the engineer, and his assistant, Mr. Bell; Mr. Blake, the agent of the company; Mr. Alexander and Mr. Barnes, locomotive engineers; Signor Copello, chief engineer for the Modane section of the tunnel; Captain Beaumont, R. E., Mr. James Drogden, Mr. Jopling, Mr. Morris and Captain Tyler, R. E., on the part of the British Government.

Mr. Fell's system consists of the application of a central double-headed rail placed on its side in the middle of the way and elevated about fourteen inches above the ordinary rails. There are four horizontal driving wheels on the engine under the control of the engine driver, which can be made by pressure to grasp the central rail so as to utilize the whole power of the engine, and so enable it to work up incredible gradients without slipping. The carriages, also, have four horizontal wheels underneath, which, with the central rail, form a complete safety guard. In addition to the ordinary break there are breaks upon the central rail. It would appear, therefore, impossible for the engine carriages to leave the rail^s where the central one is laid.

The morning was admirably adapted for the trip, the sun shining with great brilliancy upon the Alpine peaks and the numerous glaciers which are visible in the different parts of the route. After leaving the deep valley in which St. Michel is situated, the line passes by a gradient of one in thirty to the Pont de la Denise, where an iron bridge spans the river Arcq near the site of that which was carried away by the inundations of last year. As the little train passed the village of Fourneau, the workmen of the Grand Tunnel of the Alps turned out *en masse*, and, as at all other parts of the route, they were observed stooping down, and even endangering their lives for the purpose of inspecting the unusual mechanism of the engine for working on the central rail. The first very steep gradient of one in twelve was seen in passing Modane, and, foreshortened to the view, appeared on the approach as if impossible to surmount; but the engine, the second constructed on this system, had already proved equal to the task on the experimental line, and, clutching the central rail between its horizontal wheels, it glided quickly up, under a pressure of steam not more than 80 lbs. to the square inch, without apparent effort. The progress was purposely slow, because no engine or carriage had previously passed over the line, and also to give opportunity for examining the works. The damages to the road on which the line was chiefly laid were found to be substantially repaired by the French government. The magnificent scenery around, and the waterfall near Fort Sessailon were much admired, as the sharp curves afforded different views while passing on the edges of the deep ravines. The train entered Lanslebourg station under a triumphal arch, having accomplished 24 miles of distance, and attained an elevation of 2,100 feet above St. Michel.

From this point the zigzags of ascent commence, and the gradients over a distance of four miles were for the most part one to twelve. Looking down from the train near the summit, as if from a balloon, four of the zigzags were visible at the same instant, to a depth of two thousand feet. The power of the engine was satisfactorily tested in this ascent, and the summit was reached under salvos of artillery from an improvised battery, and amid the cheers of French and Italians who had gathered to welcome the English on the frontier. The engine again came to a stand under a triumphal arch, at an elevation of 6,700 feet above the sea. Flags of the three nations, and a silk flag specially presented by Signor Ginaoli to Mr. Fell, waved over a sumptuous breakfast, also provided by that gentleman. The hospice, the lake, and the plateau of the summit, surrounded by snow-clad peaks and glaciers, rising to an elevation of from 10,000 feet to 13,000 feet were passed, and the portion of the descent commenced from the Grand Croix. The railway here follows the old Napoleon road, which was abandoned long since for diligence traffic on account of the dangers from avalanche. Masonry-covered ways of extraordinary strength had here been specially provided for the railway.

The descent to Susa was a series of the sharpest curves and steepest gradients on which the central rail had been continuously laid. The Valley of the Dora, with Susa and the Convent of San Michel, and even the Superga above Turin, visible for thirty miles in the distance, presented a magnificent panorama, as the train wound through a clear atmosphere round the mountain side. The confidence of the party on a trip which would, under ordinary circumstances have been so dangerous, was manifested by their crowding round all parts of the engine, from which, under a feeling of the security afforded by the central rail, they thoroughly enjoyed the ever-changing scenes as they passed round the edges of the various precipices. Susa was entered amid the acclamations of multitudes of spectators, and the party adjourned to dine at the Hotel de France.

Thus was completed a journey unexampled in its character both as respects the steepness of gradients, the elevation of the summit level, and the difficulty with which the curves and precipices were overcome.

GRENVILLE AND COLUMBIA (S. C.) RAILROAD.

The Greenville and Columbia Railroad is constituted as follows :

	miles.
<i>Main Line</i> —Columbia to Greenville.	143 $\frac{1}{4}$
<i>Branch Line</i> —Cokesbury to Abbeville.....	11 $\frac{1}{2}$
“ “ Belton to Anderson.....	9 $\frac{1}{2}$ 21
Total length of road owned by Company.....	164 $\frac{1}{4}$
Blue Ridge R.R. (leased) Anderson to Walhalla	33
Total length of road operated by Company.....	197 $\frac{1}{4}$

The fiscal is the same as the calendar year. During the early months of 1866 the track was incomplete and remained so until May 31, and it was not until August 31 that the bridge over the Broad River at Alston was restored. In the meantime passengers and goods had been carried on the Broad River between

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THE BAGDAD RAILWAY.

IN 1875 the first section of what was known as the Anatolian Railway was built by German Engineers to the order of the Turkish Government. In 1888 it was transferred to a German company. In 1899 the Sultan, Abdul Hamid, granted to the Emperor of Germany, whom he styled "his only friend in Europe," the concession "for the extension of the said railway from the Bosphorus, across Asiatic Turkey, to the mouth of the Shat-el-Arab,¹ on the Persian Gulf."

This concession was transferred to a German Syndicate, which assumed the name of "The Bagdad Railway Company," and after certain modifications, it commenced business.

In 1903 the German company made certain proposals to England, Russia, and France to participate in the construction—by taking shares in the company.

Russia refused, as she believed it was an aggression against her spheres of influence in Armenia and North Persia, and her frontier south of the Caucasus. The interests of France were mainly financial, but the alliance with Russia compelled her to act in unison with her. England feared an intrusion upon her interests in the Persian Gulf, and so also refused.

The concession to the German company was in the following terms :—

1. A ninety-nine years' lease.
2. The construction of the line from Konia, the terminus of the Anatolian Railway to Bagdad, the ancient capital of the Saracen Caliphate on the River Tigris, and from thence to the Persian Gulf. The distance from Konia to Bagdad is 900 miles, and from Bagdad to Bassorah, 350 miles.
3. The line to be divided into twelve sections of 200 kilometres each—and to be built under so-called "Kilometric Guarantees."
4. The company to receive an annuity per kilometre of 11,000

(1) The Shat-el-Arab is the name of the stream, from the confluence of the Euphrates and Tigris, above Bassorah to the Persian Gulf

francs for construction, and 4,500 francs for working when the line was opened.

5. The capitalised value for each of the twelve sections to be calculated at 54 million francs, and Turkish 4 per cent. bonds to be issued to the company, before starting work on any given section.

These bonds, though not worth their nominal value, have nevertheless, so far, been enough to enable the company, not only to meet its expenses, but also to make a fair profit.

If Russia, France, and England decided to boycott the Bonds, then the German company could proceed only very slowly in the construction. This is what has occurred.

The line, so far, has been built to Burgulu, which is situated at the foot of the Taurus Mountains, a distance of 125 miles. It was opened in 1904. Tunnelling through the Taurus Mountains is proceeding. It has still to cross these mountains, and to cover more than two-thirds of the distance to Bagdad. The map on the next page shows the alignment, the portion completed, and the portion remaining to be built before it reaches the Persian Gulf.

Financial difficulties, revolution, the deposition of Sultan Abdul Hamid, and the publication by the new Sultan, under the inspiration of the Young Turks (the so-called Committee of Union and Progress), of constitutional government, have all operated to retard its progress.

The Young Turks really disapproved of the concession, but German diplomacy, and the natural leaning and good will of the leaders of the Turkish Army toward the German Government, restrained them from annulling it.

Since 1903, when the Conservative Government rejected the overtures of the Bagdad Company, our relations with the German Government have been very strained. This is indicated by the following extracts from German papers :—

1. *Die Post* brands English demands for control of the Gulf terminal of the Bagdad Railway as “interference with the rights of Turkey, which the Ottoman Government cannot, and will not, in any circumstances tolerate. The Bagdad Railway is a Turkish line, crossing Turkish territory. No State has a right to demand supremacy over any section of this work of civilisation. England has no right in the Turkish Bagdad Railway, other than financial. The railway is Turkish, and will remain Turkish, from the Bosphorus to the Persian Gulf.”

2. The *Vossische Zeitung* accuses Great Britain with “trying to secure for herself rights of predominance, to the exclusion of Germany, which represents the capitalists concerned in the



**MAP SHOWING THE BAGDAD RAILWAY FROM
HAIDER PASHA TO KOWEIT ON THE PERSIAN GULF**

- 1 ————— Portion already constructed to Burgulu at the foot of the Taurus Mountains.
- 2 Portion from Burgulu to Basra, to be constructed by the German Company.
- 3 xxxxxxxx Portion from Basra to Koweit, by the British Government.
- 4 - - - - - Proposed British Line from Mahamrah to Khoramabad in Persia.
- 5 ~~~~~ Line to connect Bagdad with Khanakin.
- 6 ===== Line from Angora to Kars for which France is applying for a concession.

German portion of the railway." And adds that "other ways and means to solve the problem must be found." Further, "that British proposals will not be considered satisfactory unless Germany approves of them, and that Germany can, if necessary, refuse her consent to the 4 per cent. increase of Customs duties"; also that "*the Wilhelmstrasse will repay Downing Street on the Persian Gulf for unfriendliness shown in the Morocco question.*" With regard to 1903, it says that "Mr. Balfour was not wholly responsible, but he failed to resist the popular agitation aroused by an ill-informed Press. The mistake he then made continues to bring its own punishment to the present day, and it will grow worse the longer England delays to repair the mistake."

3. The *Boerse Courier* says: "If Great Britain fails to profit by Germany's conciliatory attitude with regard to the Gulf section of the railway, that section, like the rest of the line, will be built without the co-operation of British capital."

4. The *Kreuz Zeitung* says: "The British claim to a protectorate over Koweit is unjustifiable, and should be submitted to the Hague Tribunal."

5. The *Berliner Tageblatt* says: "Turkey, as the sovereign Power over the whole region traversed by the railway, has the right to have the first word in the matter, also the final decision. The question whether Bassorah or Koweit shall be the terminus requires a solution by which Turkish interests are not threatened. Germany seeks nothing more."

6. The *Abendpost* says: "British influence at Koweit, which is the only possible Gulf outlet to the Bagdad Railway, has hitherto proved a fatal obstacle to this great project."

7. The *North German Gazette* says: "It is Britain's business, if she has any special wishes regarding the Bagdad Railway, to formulate and submit them to the only factors contractually concerned in the undertaking, namely Turkey and the Bagdad Railway Company."

8. The *Frankfurter Zeitung*: "While people in Germany have accustomed themselves to treating the Bagdad Railway as an exclusively commercial affair, Englishmen are apparently unable to divest it of the political aspect with which it has been artificially endowed. English supremacy in India, control of the Persian Gulf, the pretended protectorate over the Turkish town of Koweit, all serve as a basis for demands directly concerning what is, indisputably, Turkish territory. The British Government is urged to demand control of the terminal section of the railway, and to make the granting of this demand a *sine qua non* for future friendly relations with Turkey and Germany. That England lays claim to a protectorate over Koweit and to a control of the

terminal section of the Bagdad Railway is an incontrovertible fact. But the question is : What right has England in connection with the terminal of the Bagdad Railway?

"No matter how the Koweit pretensions may be settled, no sort of half, or full, protectorate would give the English any claim upon the southern section of the Bagdad Railway.

"As soon as the English Government applies the right standard of their own practical interests to this question, they will find the Turks and Germans sensible parties with whom to deal."

9. The *Frankfurter Gazette* says : "The Grand Vizier has made the important pronouncement that the construction of the Bagdad line as far as Bagdad is an absolute necessity, and he was personally, and irrevocably, determined to carry this policy into realisation. But in regard to the final section, from Bagdad to the Gulf, an understanding was inevitable; and he pledged the credit of the Government to the attainment of a suitable settlement."

A semi-official communication in the same paper offers to English people who are nervous about the danger to the Indian Empire the advice to consult a map, pointing out that the distance from Koweit to the Indian frontier is about the same as from Portsmouth to Naples. And it hopes that the sound instincts of Englishmen will enable them to overcome the political Chauvinism from which their handling of the question has hitherto suffered."

10. The *Norddeutsche Zeitung* invites England to formulate her wishes and demands regarding the final section of the line, and adds that they will be sure to receive friendly consideration on the part of Germany.

11. The *Vossische Zeitung*, in an issue subsequent to the one previously quoted, says : "Any proposal which would involve British control of the final section of the Bagdad line would, under no circumstances, be entertained by Germany. The agreement with Russia enables Germany to override British resistance. If England persists in her demands, Germany will know how to act, despite England.

"If Englishmen would reckon up the net profit which has accrued from their country's anti-German policy of recent years, they will find that the total is *nil*."

As a sequence to the above extracts, I will quote what the *Tanin*, a Turkish paper, says :—

"In 1901 Great Britain undertook not to occupy Koweit or to extend protection to Sheikh Mubarak. Turkey simultaneously agreed not to send troops to Koweit, and to respect the *status quo*. Nevertheless, in consequence of the project to build a railway

from Bagdad to Bassorah, the existing situation cannot continue. Moreover, there is a necessity for securing order in Mesopotamia."

It adds: "As Turkey will respect the rights of Great Britain in the Persian Gulf, she hopes, by friendly negotiations, to obtain a favourable solution of the Koweit question."

I think there is very little doubt that the article in the *Tanin* was inspired by German diplomacy, and that the Turkish Government has been tutored to lay claim to a suzerainty over the Sheikh of Koweit. It is borne out by a further article in the *Vossische Zeitung*, to the effect that "the British Government has proposed that the four Powers chiefly concerned, viz., England, Turkey, Germany, and France, should each participate in the financing of the scheme, to the amount of one quarter of the capital required; in return for which England is willing to admit the Turkish claim to the suzerainty over Koweit." It appears, however, that the proposal of participation in the financing of the scheme emanated from Turkey, and not from England, and was to the effect that Turkey and Germany should each hold 30 per cent. of the shares, and England and France 20 each. As this would have placed the control of the line entirely in the hands of Turkey and Germany, England objected to the proposal.

Now let us examine the political status of Koweit. In 1899, when the Conservative Government was in power, and Lord Cranborne was the Under Secretary of State for Foreign Affairs, Lord Curzon, then Viceroy of India, concluded a secret treaty with the Sheikh of Koweit, by which "the Sheikh agreed not to cede any territory to third parties, and to conduct all his foreign relations in accordance with our wishes." This treaty bears the date January 25th, 1899. Either the Sheikh had the power, or he had not, to make this treaty. It is argued that, though he was practically independent, as all the Sheikhs in those parts are, he acknowledged the suzerainty of the Sultan; and that the Crescent, as an emblem of the suzerainty, floated over his house. His explanation of it was that it was merely an emblem of the Moslem faith, and by no means a symbol of Turkish sovereignty; and that he paid no taxes to the Sultan.

When Lord Morley was Secretary of State for India, this subject was discussed in the House of Lords, and this is what he said on the 22nd of March, 1911:—

"The position, as his Majesty's Government found it in December, 1905, when they assumed office, was that the concession of the Bagdad Railway, from Konia to Bagdad, Bassorah, and some indeterminate point on the Persian Gulf, had been granted some years before. The concession was not only for the main line, but also for certain branch lines, the most important

of which was the line to Khanakin, on the Turco-Persian frontier. Articles appeared in the papers daily assuming that we had a right there to do what we pleased. But the fact was, it was not our soil, but belonged to Turkey. The Germans were there, because the Turkish Government had given them the right to be there." He understood that certain important arrangements had been recently arrived at in Constantinople, and that they were substantially as follows :—

"By arrangements between the Turkish Government and the German Concessionnaires under the Convention of 1903, the Bagdad Railway Company acquired the right to build a line to some point on the Persian Gulf, to be determined thereafter. Under Article 12 of the Convention, the Company acquired certain preferential rights to construct branches to the Mediterranean, on the coast of Syria.

"Under the arrangements now arrived at in Constantinople, his Majesty's Government understood that the Company renounced their right to the section of the railway between Bagdad and the Persian Gulf, and also their right to construct a port at Bassorah, on condition that they received a certain share in any new Company—presumably a Turkish Company—formed to carry out the parts of the line which they had now renounced. On the other hand, in fulfilment of the terms of the Concession, the Company had come to an arrangement whereby first their branch line was to be built from Oormanich on the main line to Alexandretta—on the Gulf of that name. And secondly, that certain revenues were to be allocated to them, in accordance with Article 35 of the Concession of 1903. By this arrangement the Turkish Government had regained its liberty of action regarding the section of the railway between Bagdad and the Persian Gulf. His Majesty's Government now wished to arrive at a settlement which would remove all apprehension that the Bagdad Railway and its terminus would create diplomatic friction between the parties interested. But Germany, as the original Concession holders, would have to be consulted, and her agreement would be necessary."

Since the 22nd of March, 1911, when the above speech was delivered, further developments have been as follows :—

1. A correspondent, writing from Constantinople to the German paper, *Lokal Anzeiger*, says : "The Porte has decided to negotiate with Germany alone about the construction of the Bagdad Railway as far as Bagdad. There is to be an exchange of views between Turkey and Germany with reference to the extension of the line to the Persian Gulf, and on the basis of these views negotiations will be opened with England and France."

2. In furtherance of these views, the following proposals were made :—

The capital to be equally divided between Turkey, Germany, Great Britain, and France. Each to have equal participation on the Board of Directors, the President to be an Ottoman, with, however, one vote only. Regarding the branch railway to Alexandretta, mentioned by Lord Morley in his speech, the Ministry of Public Works in Constantinople, having finally approved the plans for the Mediterranean port of the Bagdad

Railway at Alexandretta, and the branch line from Toprakkale to Alexandretta, work on these lines is being carried out.

The negotiations regarding Koweit, and England's sphere of influence in that State and the Persian Gulf, were temporarily suspended when the Turco-Balkan War broke out. Russia has withdrawn her opposition, as the result of the meeting between the Czar and the Kaiser at Potsdam in November, 1910, and no longer desires to have a share or any control over the railway. The reason for the withdrawal is said to be an arrangement that Germany will not oppose the construction by Russia of a railway in the north of Persia, linking on to the Bagdad Railway at Khanikin on the Persian frontier.

I really cannot see what interest, financial or otherwise, France has got in this matter. She certainly poses as the protector of the Syrian Christians, and has done so ever since the Druses and Maronites of Mount Lebanon were at war with each other about fifty years ago; but this does not give her any claim to share in the construction of the Bagdad Railway. And now that her ally and predominant partner, Russia, has retired, we ought, if our "Entente Cordiale" is more than a name, to get her to retire also.

It appears from the Paris papers, notably the *Temps* and the *Libre Parole*, that the French Foreign Office still thinks it has an interest in the negotiations. We ought to be able to convince it that the continuance of this attitude only perpetuates the existing friction between ourselves and Germany, and prevents an amicable settlement. The question would then concern only Turkey, Germany, and ourselves. And with resolution and firmness, we ought to be able to arrange that Germany should construct the railway as far as Bagdad, and we from Bagdad to the Persian Gulf. We should strive to get our protectorate over Koweit acknowledged by the Sultan (Germany has no right to object to it) or under his suzerainty. If possible, we should try to arrange matters amicably, and not be deterred, or intimidated, by bluff and bluster. Our attitude must be immovable; we cannot divide with Germany the control of the line between Bagdad and Koweit. In the words of Lord Lansdowne, spoken in 1903: "We should regard the establishment of a naval base, or of a fortified port, in the Persian Gulf by any other Power as a grave menace to our interests, and should certainly resist it by all the means at our disposal."

The following is the present Grand Vizier's statement on the subject:—

"The granting of the Concession to a German Company, with kilometre guarantees, in preference to an English Company, which was ready to

undertake the enterprise without such guarantees, was the work of a previous Government. It would be useless to criticise it now.

"The duty of the present Government is to respect the arrangement. We shall never tear up the convention which we have concluded. The State has lost nothing through kilometric guarantees. The prolongation of the line has been definitely decided. The linking up of Constantinople and Bagdad will guarantee our future prosperity. The £300,000 a year which the final section to Bagdad will cost us is nothing beside the result we are determined to attain. We will never abandon the scheme. Regarding the line from Bagdad to Bassorah, we hope to conclude a satisfactory arrangement. We shall overcome all obstacles. Our only aim is the interest of our Empire."

It will be observed that he has said nothing about the German Company's right to continue the construction of the line from Bagdad to the Persian Gulf, nor has he touched on the claim of Turkey to the suzerainty over Koweit.

Since the above statement was made, a considerable change in the demeanour of Germany has occurred. Some people attribute it to Lord Haldane's mission to Berlin, followed by Lord Morley's visit; others, to Sir Edward Grey's firm attitude, he having declared that it was England's firm intention to insist on our rights in the Persian Gulf. These combined appear to have impressed Germany and Turkey with the conviction that England cannot be trifled with, and that without her adherence and whole-hearted consent, the difficulties which exist at present cannot possibly be removed. This is shown in the more moderate language now used by the German Press.

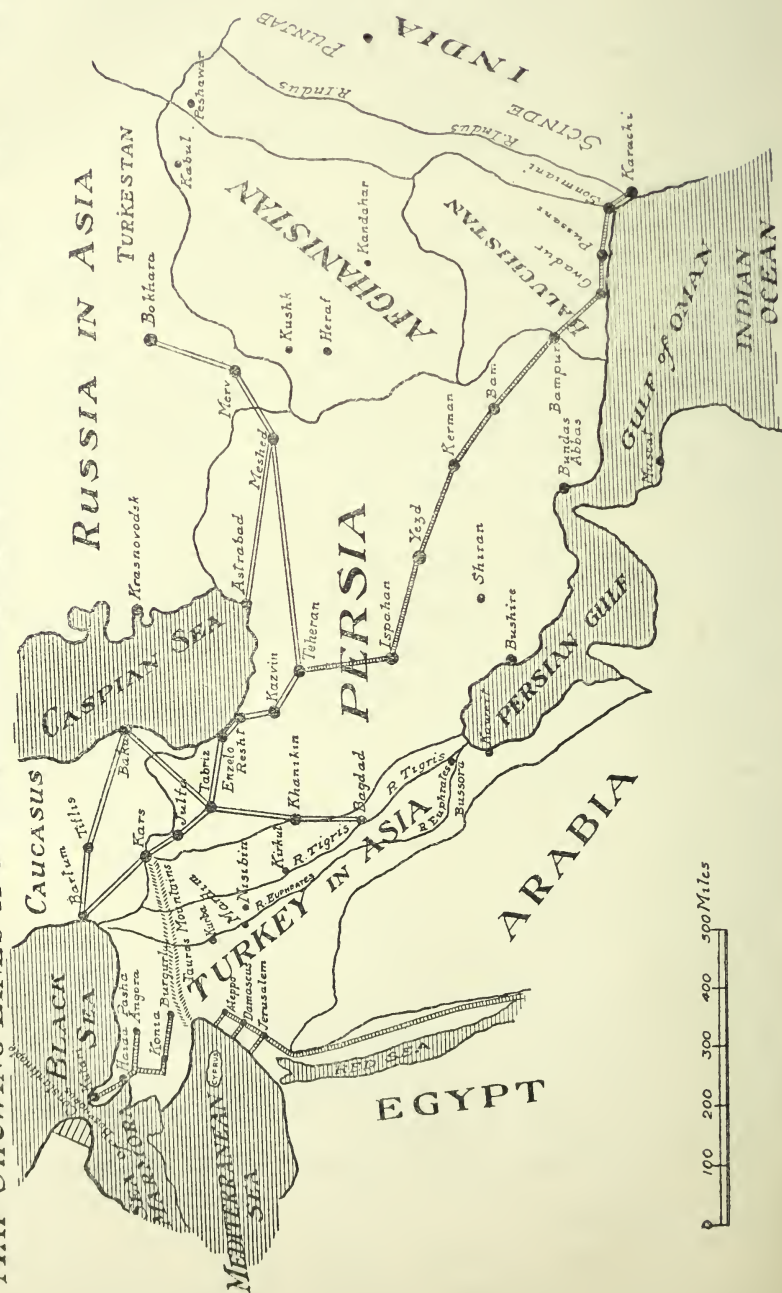
In almost similar terms, the *Norddeutsche, Allgemeine Zeitung*, and *Kölnische Zeitung* publish the significant statement that "there is not the least reason, political or otherwise, why English money should not be allowed to share in the construction of the final section of the line, the railway being nothing more than a route intended to open up the districts of Turkey in Asia, at present unapproachable, to the trade of all nations."

The *Frankfurter Zeitung* and the *North German Gazette* say: "We desire to call special attention to the fact that the name of Koweit does not appear in any form in the Bagdad Concession. The Bagdad Company is authorised to build the line from Zobeir (near Bassorah) to some point on the Persian Gulf. It need not, therefore, be built directly to Koweit, although the harbour of that place has many advantages."

The *North German Gazette* further "assures England that doubts regarding anti-British preferential rates on the Bagdad line are groundless."

The French paper, *Le Temps*, remarks on this: "The English Government will, no doubt, recognise Turkish sovereignty at Koweit, on the condition that the autonomy of the Sheikh is

MAP SHOWING LINES OF RAILWAY WHICH RUSSIA PROPOSES TO BUILD IN PERSIA



respected, and that English interests are fully admitted and safeguarded."

It is now said that an Anglo-Turkish understanding, in connection with the Persian Gulf, has been arrived at, as follows :—

"The Turkish Government recognises the British protectorate over Koweit, and concedes the eventual right of the construction of the line from Bassorah to Koweit; that Bassorah shall be considered the terminus of the Bagdad Railway, and that the line shall be continued from Bagdad on the same conditions as the other sections of it.

"At least two British delegates shall be appointed to the Directorate, in order to supervise all transactions, and prevent discrimination in the treatment of goods."

Now let us consider the agreement at which the Emperor of Germany and the Czar of Russia arrived, when they met at Potsdam in November, 1910.

By this agreement, as already stated, "Russia withdraws all opposition to the construction of the Bagdad Railway, on condition that she is allowed a free hand in the building of railways in the North of Persia. That is, that Germany will raise no objection to it." And that the "Bagdad Railway Company will connect at Khanakin with the projected Russian line."

I presume that, if our present relations with Russia continue, the projected railways, from Baku on the Caspian Sea to Julfa, Tabriz, Enzeli, Resht, Kazvin, Teheran, and Meshed in the North of Persia, and branch lines from Teheran to Astrabad, and from Tabriz to Khanakin—as shown on the accompanying map—will be constructed. Although they will not pass through Turkish territory and do not concern Turkey, they are a much greater menace to our Indian Empire than the Bagdad Railway, and apparently beyond our control. Meshed, the sacred city of Persia, is only 200 miles from Herat, which is on the boundary of Western Afghanistan, and about 340 miles from Merv in Russian Turkestan. Russia has already a railway line extending from Merv to the borders of Afghanistan. If we should ever be at war with her, and this, owing to her tortuous policy and the difficulty of our placing any reliance on her diplomatic methods, is very probable, she would have two lines of railway, by which she could throw large bodies of troops into Afghanistan, and overthrow all the forces that the Afghans might bring against her, long before we could reach Herat, which is 369 miles from Kandahar and 881 miles from Peshawur. The *Noroye Vremya* of December 9th, 1912, says, with regard to Lord Curzon's speech in the House of Lords : "It is criminal. Even England's enormous influence in Asia would not avail to put back for a single day the inevitable

destiny of Persia, if Russia determined to bring matters to an end there. The invincible British Fleet could not prevent Russia from occupying Teheran, if she so desired."

It does not appear probable, at the present moment, that the Ameer of Afghanistan would agree to our extending the Scinde-Peshin Railway to Kandahar, and from Kandahar to Herat. Even if he did, it would take years, and cost millions of money, before it could be completed. What is there to prevent Russia from forestalling us, and occupying Herat on the commencement of hostilities?

It cannot be too seriously impressed upon Parliament and the Foreign Office that our interests in Persia and the Persian Gulf have been in existence ever since the founding of our Indian Empire; that Russia's interest, if at all admitted by us, is, in comparison, of very recent date; while Germany's interest in Asia Minor and Asiatic Turkey dates only from 1888 and 1899.

Our *entente* with Russia, for which France is responsible, has not only created ill-feeling in the hearts of all the Mahomedan races throughout the world, but has also discredited us in the eyes of Europe. It is openly talked about on the Continent that the war between Turkey and the Balkan States, with its dire results, has been due to the intrigues of Russia and France. That they were both jealous of the influence which Germany had acquired in the councils of the Sultan, and of the concession for the construction of the Bagdad Railway. The first step in the intrigue, it is said, was the instigation of the Young Turks (a great many of whom were educated in France, and who formed a large proportion of the leaders of the army) to depose the Sultan Abdul Hamid, and to set up a constitution. The second step was an attempt to induce the new Sultan and the Young Turks to cancel the Bagdad Railway concession, on the plea that, owing to his deposition, all the acts and concessions of Abdul Hamid lapsed *de jure et de facto*. But the Young Turks, and the Turkish people generally, had for years been in favour of the railway, believing that it would be of great advantage in assisting them to consolidate their military strength, and to bring over large bodies of fighting men from the Asiatic provinces, and thus enable them to cope with the Balkan States in the war which they knew was approaching. The Balkan States had not completed their arrangements when Montenegro precipitated matters by proclaiming war. It is said, and believed, by Germans, Austrians, and Hungarians that this was done at the instigation of Russia. We have been drawn into the negotiations which are now taking place, although we have no political interests in the quarrel.

An article in a French paper, *Le Temps*, now states: "The

position in the negotiations between Turkey on the one hand, and England and Germany on the other, in connection with the Bagdad Railway, is as follows :—Several months ago Turkey and England arrived at an agreement with regard to the Bagdad-Persian Gulf section (1) that English capital was to be represented in the Bagdad-Bassorah section by two English administrators ; (2) that the Bassorah-Koweit section was not to be constructed ; (3) England obtained certain advantages in the Koweit region.”

The German Government, on being informed of these negotiations, declared that “it by no means considered the rights appertaining to it by virtue of the firman of concession of the Bagdad-Persian Gulf section had been annulled by the concession of the port of Alexandretta. *It claimed, therefore, to participate both in the negotiations and the construction of the Bassorah-Koweit section of the railway, or at any rate to secure compensating advantages.*”

“The advantages it claimed were : A promise that, at the financial conference in Paris, the representatives of Great Britain will support those of Germany when they ask that the Customs surtax affected by the guarantee of the Bagdad Railway be maintained, *and renunciation on the part of England to construct a branch starting from Mohammirah.* This matter is being discussed with the French Government.”¹

In connection with it, let us carefully study the announcement just made in Parliament by Sir Edward Grey, viz. :—

(1) “That Great Britain withdraws objections to German construction of the Railway as far as Bassorah.”

(2) “*An extension of the Railway from Bassorah to the Persian Gulf must be conditional upon British approval.*”

(3) “Two British Directors will have seats on the Railway Board, as a guarantee against differential rates; not that these have ever been a subject of grievance on the Anatolian and other German Railways in the Ottoman Empire.”

(4) “Great Britain waives the idea of participation in the construction of the line.”

(5) “The navigation of the river up to and beyond Bagdad is a substantial British interest which may be developed and consolidated.”²

(6) “Turkey’s suzerainty of the Gulf is recognised; and the proposed agreement is direct between Great Britain and Turkey, not between Great Britain and Germany; but Turkey recognises the autonomy of the Sheikh of Koweit at the Gulf.”

(1) Evidently the above article has been inspired by the French Foreign Office.

(2) Bagdad is on the River Tigris, 190 miles above its junction with the Euphrates. Nothing is said about the latter river, although it is also navigable almost up to Aleppo.

(7) "In South Persia Great Britain claims the right to construct railways; and such a railway is under survey from Mohammirah to Khoramabad."¹

As we have "waived the idea of participation in the construction of the Bagdad line," the right of it, of course, will belong solely to Germany. Suppose—and it is not an impossible supposition—that Russia and Germany were at some future date to join hands, the peril to our Indian Empire would be very serious.

In the explanation given in 1908 by Sir Edward Grey in Parliament, in connection with the treaty with Russia regarding spheres of influence in Persia, he said: "The main part of the agreement is not commercial, but strategical, and of the strategical position Seistan is the key. To have left Seistan within striking distance of Russia would have been a real danger, and would have led to an increased charge on India for extra defence." No doubt this was all quite true. But when Russia has completed her railway from Batoum and Baku, on the Black and Caspian Seas, to Meshed—within striking distance of Herat—the danger to India will be very much greater, and very real.

A French paper, the *Journal*, now states that, in addition to the diplomatic negotiations relative to the interests of Germany and Russia in Turkey and Persia, pourparlers have been opened for floating a Russian loan of twenty million pounds in Berlin; and that the banking firm of Mendelssohns will undertake it.

I append a translation of an article in the *Berliner Tageblatt* of December 29th, 1913, alluding to one in the *Tägliche Rundschau*, regarding the developments which have taken place in this matter:—

"For years this undertaking (the Bagdad Railway) has threatened to become a bone of contention between Russia, England and Germany. The German Government has now, through its cleverness and tenacity, succeeded in removing all differences, and in bringing the line altogether into German possession.

"When the 'Deutscher Bank' sought and succeeded in obtaining the first concession for the Anatolian Railway, that forerunner of the Bagdad Railway, nearly twenty-five years ago, the first section of the Anatolian Railway was granted to France, as later the section of the present Bagdad Railway to the Mediterranean (Adana-Merina) fell to an English Company. At the present moment the completion of the whole line from Constantinople to Bassorah viâ Bagdad; from the Bosphorus to the Persian Gulf; is

(1) It will be noticed in Germany's claims already mentioned, and underlined by me, she claims "renunciation on the part of England of her claim to construct a branch starting from Mohammirah." There is therefore, apparently, a conflict between her and England on this point; and she very probably thinks that as she has gained her wishes on all other points, she will succeed in this one also. The Government (Conservative) which was then in power is very much to blame for allowing her to obtain a footing in Asiatic Turkey. Perhaps it was in return for the assistance she gave us at the Berlin Conference in 1878, regarding which the Earl of Beaconsfield declared that "he had brought back peace with honour."

secured by a Company controlled by the 'Deutscher Bank' without English or French participation. And in three years' time the Bagdad Railway will run from the Bosphorus to Bassorah, viâ Bagdad, and will be able to convey its passengers and goods to the steamers of the Hamburg-America line. Not only is the main line across Asia Minor secured, but also two branch lines, stretching east and west—from Bagdad past Khanakin into Central Persia, and from Aleppo to the Mediterranean, viâ Alexandretta. In addition, three forts, Constantinople-Haidarpasha on the Bosphorus, Alexandretta on the Mediterranean, and Basra on the Persian Gulf, all bear witness to the result of German enterprise and capital."

In this way will be accomplished, says the *Tägliche Rundschau*, a work in which Germany has from the beginning invited the participation of all the Powers, including France, England, and Russia; it will be achieved without Russia, England, or France, and in spite of their opposition.

Russia was the first to come to terms with the Bagdad Railway—which, though it could not be prevented, could still be delayed—in the Potsdam Treaty of two years ago, which brought about the understanding between Germany and Russia, and arranged that they should share in an extension from Bagdad to Teheran. By this, Germany obtained the yield of the rich petroleum wells on the Turco-Persian border, and access for her trade with Persia itself; Russia gained access to the Mediterranean and, viâ the Bagdad Railway, to the Persian Gulf, both hitherto prohibited by England.

England has also, during the Balkan war, seen her way to change her Eastern policy, and that with regard to Germany especially. An understanding was arrived at in the Anglo-German negotiations, and an agreement was reached as to the future extension to Bassorah by the Bagdad Railway Company, to give it its present title; and, in addition, the completion of the harbour of Bassorah on the Gulf, by means of an Anglo-German company, under a German board of directors.

Paul Dehn reckons the Indian parcel traffic over the Bagdad Railway at fifteen trucks a week, and 15,000 passengers per annum.

With regard to shipping on the Tigris, and the African and other questions, the Anglo-German agreement shows a satisfactory understanding. Turkey, on her part, changes her false position in Koweit for the real advantage of the consent of England to the increase of the Customs duties there, and the employment of them for the Bagdad Railway.

Finally, France also has now made up her mind. She was originally invited to join, but Delcassé refused, putting, as he did, the policy pursued by Russia before the consideration of the interests of the French railways in Asia Minor in connection

with the Bagdad Railway. France now renounces all further opposition to the railway, and agrees to the increase in the Turkish Customs, and its employment on the line.

She also gives up all influence in the Bagdad Railway by returning to the Deutscher Bank all her shares (one-third).

Le Temps is right in saying, with resignation, that only one settlement could be expected in the future. There were two possibilities: the admission of the Bagdad shares on the Bourse, or the return of them to the Deutscher Bank. It is the second of the alternatives that has taken place.

With Russia and England indifferent, the French share in the capital of the railway, a mere third, ceased to have any practical influence on the management of the German undertaking in Asia Minor. Therefore, a settlement was obviously necessary.

This shows clearly that German diplomacy, backed up by German bluff and bluster, has gained its ends. It will, no doubt, in time squeeze us out of Asiatic Turkey, as it succeeded in squeezing us out of East Africa, where we surrendered to her country which was ours by virtue of having been explored by Speke, Grant, and Stanley.

Parliament alone should have the power in the making of treaties. The Foreign Secretary should be only the medium for presenting the necessary information.

T. A. O'CONNOR.

of a fan tail that looks to you to be at least six inches across—and the current slides on, silverlike, smooth, indifferent to the wild leap of your heart.

Like a crazy man, you shorten your line. Six seconds later your flies fall skillfully just up-stream from where last you saw that wonderful tail.

But six seconds may be a long, long period of time. You have feared and hoped and speculated and realized—feared that the leviathan has pricked himself, and so will not rise again; hoped that his appearance merely indicated curiosity which he will desire further to satisfy; speculated on whether your skill can drop the fly exactly on that spot, as it must be dropped; and realized that, whatever be the truth as to all those fears and hopes and speculations, this is irrevocably your last chance.

For an instant you allow the flies to drift down-stream, to be floated here and there by idle little eddies, to be sucked down and spat out of tiny suction-holes. Then cautiously you draw them across the surface of the waters. *Thump—thump—thump*—your heart slows up with disappointment. Then, mysteriously, like the stirring of the waters by some invisible hand, the molten silver is broken in its smoothness. The Royal Coachman quietly disappears. With all the brakes shrieking on your desire to shut your eyes and heave a mighty heave, you depress your butt and strike.

Then in the twilight the battle. No leisure is here, only quivering, intense, agonized anxiety. The affair transcends the moment. Purposes and necessities of untold ages have concentrated, so that somehow back of your consciousness rest hosts of disembodied hopes, tendencies, evolutionary progressions, all breathless lest you prove unequal to the struggle for which they have been so long preparing. Responsibility, vast, vague, formless, is yours. Only the fact that you are wholly occupied with the exigence of the moment prevents your understanding of what it is, but it hovers dark and depressing behind your possible failure. You must win. This is no fish; it is opportunity itself, and once gone it will never return. The mysticism of lower dusk in the forest, of upper afterglow on the hills, of the chill of evening waters and winds, of the glint

of strange phantoms under the darkness of cliffs, of the whisperings and shoutings of Things you are too busy to identify out in the gray of North Country awe—all these menace you with indeterminate dread. Knee-deep, waist-deep, swift water, slack water, down-stream, up-stream, with red eyes straining into the dimness, with every muscle taut and every nerve quivering, you follow the ripping of your line. You have consecrated yourself to the uttermost. The minutes stalk by you gigantic. You are a stable pinpoint in whirling phantasms. And you are very little, very small, very inadequate among these titans of circumstance.

Thrice he breaks water, a white and ghostly apparition from the deep. Your heart stops with your reel, and only resumes its office when again the line sings safely. The darkness falls, and with it, like the mysterious strength of Sir Gareth's opponent, falls the power of your adversary. His rushes shorten. The blown world of your uncertainty shrinks to the normal. From the haze of your consciousness, as through a fog, loom the old familiar forest, and the hills, and the River. Slowly you creep from that strange and enchanted land. The sullen trout yields. In all gentleness you float him within reach of your net. Quietly, breathlessly, you walk ashore, and over the beach, and an unnecessary hundred feet from the water, lest he retain still a flop. Then you lay him upon the stones and lift up your heart in rejoicing.

How you get to camp you never clearly know. Exultation lifts your feet. Wings, wings, O ye Red Gods, wings to carry the body whither the spirit hath already soared, and stooped, and circled back in impatience to see why still the body lingers! Ordinarily you can cross the riffles above the Half-Way Pool only with caution and prayer and a stout staff craftily employed. This night you can—and do—splash across hand-free as recklessly as you would wade a little brook. There is no stumble in you, for you have done a great deed, and the Red Gods are smiling.

Through the trees glows a light, and in the center of that light are leaping flames, and in the circle of that light stand, rough hewn in orange, the tent and the table and the waiting figures of your compan-

ions. You stop short, and swallow hard, and saunter into camp as one indifferent.

Carelessly you toss aside your creel—into the darkest corner, as though it were unimportant—nonchalantly you lean your rod against the slant of your tent, wearily you seat yourself and begin to draw off your drenched garments. Billy bends toward the fire. Dick gets you your dry clothes. Nobody says anything, for everybody is hungry. No one asks you any questions, for on the River you get in almost any time of night.

Finally, as you are hanging your wet things near the fire, you inquire casually over your shoulder :

"Dick, have any luck?"

Dick tells you. You listen with apparent interest. He has caught a three-pounder. He describes the spot and the method and the struggle. He is very much pleased. You pity him.

The three of you eat supper, lots of supper. Billy arises first, filling his pipe. He hangs water over the fire for the dish-washing. You and Dick sit hunched on a log, blissfully happy in the moments of digestion, ruminative, watching the blaze. The tobacco-smoke eddies and sucks upward to join the wood-smoke. Billy moves here and there in the fulfillment of his simple tasks, casting his shadow wavering and gigantic against the firelit trees. By and by he has finished. He gathers up the straps of Dick's creel, and

turns to the shadow for your own. He is going to clean the fish. It is the moment you have watched for. You shroud yourself in profound indifference.

"Sacré!" shrieks Billy.

You do not even turn your head.

"Jumping giraffes! why, it's a whale!" cries Dick.

You roll a blasé eye in their direction, as though such puerile enthusiasm wearies you.

"Yes, it's quite a little fish," you concede.

They swarm down upon you demanding particulars. These you accord laconically, a word at a time, in answer to direct questions, between puffs of smoke.

"At the Narrows. Royal Coachman. Just before I came in. Pretty fair fight. Just at the edge of the eddy," and so on. But your soul glories.

The tape-line is brought out. Twenty-nine inches it records. Holy smoke, what a fish! Your air implies that you will probably catch three more just like him on the morrow. Dick and Billy make tracings of him on the birch bark. You retain your lofty calm; but inside you are little quivers of rapture. And when you awake, late in the night, you are conscious first of all that you are happy, happy, happy, all through; and only when the drowse drains away do you remember why.

[TO BE CONTINUED]

The Pan-American Railway

By Charles M. Pepper

Special Commissioner

EVERY great enterprise must wait its turn. Especially is this so if it be of an international character. The Pan-American, or Intercontinental, Railway project has had a long wait. Its turn seems now to be coming.

The origin and conception of the plan are old. First the dreamer, musing on waking the sleeping richness of continents. Then the statesman with imagination, who grasps the idea in its bolder outlines. After him the captains of industry, the practical men of affairs who also have imagination.

The broad events which are converging

and are focusing the intercontinental railway project as a measure of the not remote future are easily seen, though their bearing may not yet be understood fully by busy persons whose minds are occupied in other fields. Among them are the changes of a political character which have come since the results of the Spanish-American War established the international relation of the North American Republic to its neighbors on the south. This relation properly may be studied in its influence on industrial and commercial development.

Then there is the coincident fact of

New York striving successfully for supremacy as the money center of the world. Though it is only dimly seen even by those who are the strategists and generals in this campaign, the increased prestige of New York inevitably will bring the financing of future Central and South American operations there. The \$500,000,000 American gold which has gone into Mexico has overflowed naturally in that country into railway-building, and it is a simple process for it to flow on south with the geographical current.

A final, determinate, and positive factor, and one which gives promise of the earliest results, is the construction of the isthmian canal. With this Government enterprise under way, there is the certainty of private projects for exploitation and development, and of these railways on either side of the canal reaching out into Central America and into Colombia are sure to be the outcome. They will form links in the Pan-American route.

With this understanding of the controlling conditions and circumstances, it is well to look to the actual groundwork for the intercontinental trunk line which may make it possible to go by rail from New York or San Francisco to Buenos Ayres. The period of public receptiveness for the gigantic plan has come. Thirty years ago and more a United States consul in South America, Hinton Rowan Helper, began the agitation for a three Americas' railway. Others also took up the idea. When James G. Blaine's dream began to take form and the First International Conference of American States was held in Washington in 1889-90, the Pan-American railway project was strongly urged by him. To his mind it was a leading element in the policy of which he was the exponent. Among the delegates of the United States to that Conference were former Senator Henry G. Davis, of West Virginia, a practical railway-builder, and Andrew Carnegie. The idea appealed to them as it did to Mr. Blaine, and probably in its industrial and commercial aspects even more than to the great Secretary of State.

This Conference adopted a series of strong resolutions favoring the building of the intercontinental railway, and as a first step recommended an international survey. President Harrison, in full sym-

pathy with Mr. Blaine, approved the project as vast but practicable, and recommended to Congress the appropriation necessary for this purpose, which was made. This fund was supplemented by the various governments.

With this authority, three corps of engineers were placed in the field under the direction of a commission of which Mr. A. J. Cassatt, of the Pennsylvania Railroad, was chairman. The surveys were made under the immediate supervision of Mr. William F. Shunk, eminent in his profession. The results were embodied in a series of reports which covered the territory from the northern border of Guatemala and along the Andes to the northern frontier of the Argentine Republic. Estimates also were made for projected surveys and connections with the railway systems of Brazil and Paraguay, as well as for a branch across from Colombia to Venezuelan seaports. Furthermore, the route was mapped out for a branch to the Colombian port of Cartagena on the Caribbean Sea.

The principals in this international survey modestly spoke of their work as a railway reconnaissance. It was more. Its technical value was unquestioned. The exposition of the engineering difficulties was explicit enough to furnish those who might want to doubt with grounds for their doubts, but among experienced railway-builders there were few to question the conclusions reached by the survey corps. These conclusions were that no engineering obstacles existed which could not be overcome, and that the cost of construction would be reasonable enough to justify the enterprise from the commercial standpoint. Nothing led to the belief that the engineering problems of the Andes which are yet to be solved were greater than those which had been solved by Henry Meiggs in Peru. The justification of this international survey is shown in the extent to which it has been followed in actual railway construction, and also as the basis for supplemental and independent reconnaissances by private enterprise. The published volumes, in both the technical and the general information which they give, are convincing literature of the feasibility and utility of a Pan-American intercontinental trunk line.

When the Second International Ameri-

can Conference met in Mexico in the winter of 1901-02, the intercontinental railway was a leading theme. Reports were made by the delegates of the different countries of their existing systems and of actual and projected railway construction. These reports were a tonic. They showed that the international survey in several instances was being used as the basis for railways under construction, and in other instances it was being tested for variations and branch feeders which might prove useful in the development of natural resources. It was shown that the Mexican system was almost complete, and that the time was not far off when New York, Chicago, or San Francisco would be in direct communication by rail with the heart of Central America. Other information told how the gaps were being closed in South America.

Since these reports were made, the line from Cordoba, near Vera Cruz, has been completed to a junction with the Tehuantepec isthmian railway, and the Mexican Government is pushing the construction of the Pan-American line from San Geronimo south towards the Guatemalan border. When this work is a little further advanced, the Guatemalan Government will take steps to close up the gap of thirty miles necessary to bring its railway system to the frontier of Mexico. American interests identified with the two trunk lines which enter the United States through the gateways of El Paso and Laredo already are reaching out for the traffic which may be had when this Central American connection is established.

The Government of the Argentine Republic has pushed the building of its railway lines from Jujuy, formerly the northern terminus, till they are now close to the boundary of Bolivia, and Bolivia also is encouraging the extension of its system south along the route of the intercontinental survey so as to connect with the Argentine system. Chili, which has a most extensive railway network, is encouraging the trans-Andean project that will bring Santiago into through rail connection with Buenos Ayres. Peru is also having an era of railway-building, some actual, more in prospect. By the end of the present year it is likely that the gaps between New York and Buenos Ayres on the intercontinental route will not aggre-

gate more than 4,700 miles, as against 5,200 miles when the last reports were made.

The second American Conference took practical steps, not only to conserve what had been done, but to encourage progress along definite and clearly marked lines. It adopted a series of recommendations, among others one that a permanent committee be appointed and that the United States be invited to initiate measures for sending representatives to the various countries to further the common aspiration for building the intercontinental railway. The permanent Pan-American Railway Committee thus designated is composed of Henry G. Davis, of West Virginia; Andrew Carnegie, of New York; Manuel de Aspiroz, Ambassador from Mexico; Manuel Alvarez Calderon, Minister from Peru; and Antonio Lazo Arriaga, Minister from Guatemala. Mr. Davis was a delegate to the Conference held in Mexico. The headquarters of the Committee are in Washington.

The Congress of the United States, at its last session, authorized the appointment of a Special Commissioner to carry out the recommendations of the Mexican Conference with regard to the Pan-American Railway. The President, at the suggestion of the Secretary of State, made the appointment, and instructions have been issued to the diplomatic and consular representatives of the United States to co-operate with the Special Commissioner. The Ministers of the various Governments of the Latin-American countries accredited in Washington also have taken measures to insure the success of the mission. The Commissioner will visit the capitals of all the countries to the south of the United States.

This is the status of the subject as it exists to-day. No illusions cloud it. The broad fact is that the Government of the United States and the Governments of the other Republics are disposed to work in unison, and with this co-operation and encouragement the links in the Intercontinental American Railway gradually may be welded together. On the part of the Central and South American countries there is the basic notion of affirming their own unity by the closer connection which railway communication establishes. There is, moreover, the substantial advantage

which comes from the exploitation of their natural resources and the development of their commerce. Railroads are built from many motives. They live by the traffic which they develop and create.

In a general way, it may be assumed that accurate information with respect to the existing systems of Central and South American railroads, the lines projected, the resources which are awaiting development by further building, the code of laws under which the railways are operated, the special inducements for foreign capital in the form of concessions, subsidies, land grants, guarantees of interest and principal of bonds, if presented under the sanction of official statements, will have a direct interest for the overflowing American capital which within a few years will begin to turn southward in search of greater returns than it gets at home.

Without reflecting on their ignorance, it may be said that the American people know little of the existing South American railways and less of the projects and possibilities. They do not know how the Brazilian lines are largely the work of Brazilian engineers; how near the little inland river-bordered Republic of Paraguay is to joining its line with the Argentine network; how complete are the systems of the Argentine Republic and of Chili, and how near realization is the trans-Andean project.

Kindred to this main subject of the Pan-American Railway is the question of river communication. It, too, is a vast subject, yet is thoroughly practicable. Those who would understand the full scope of connecting the intercontinental trunk line by means of branches with the inland waterways of South America should read the report made to the Mexican Conference by the distinguished Colombian, General Rafael Reyes. He, with his brothers, Henry and Nestor, both of whom perished in the work, explored the greater part of the Amazon and its affluents.

"The extension of the territory that these rivers irrigate," says General Reyes, "is more than 4,000,000 square miles, which are to-day virgin soil and which are offered to commerce and to human industry." In his intensely interesting and graphic account he gives a most compre-

hensive idea of the course which an American traveler might follow after going from New York to Buenos Ayres by rail. This would take the traveler on the Río de la Plata and the Parana to the Amazon, and through its affluents into Bolivia, Peru, and Ecuador; then to Colombia and to Venezuela through the branches of the Orinoco, and back to the Amazon.

Compared with the great transcontinental routes the Pan-American Railway project is not wonderful. Now that passengers may take their little journey to Moscow, and then proceed across Siberia to Port Arthur or Vladivostok, reaching the Pacific in less than eighteen days, the trip from New York to Buenos Ayres should be included in future itineraries. It is true that instead of an autocratic government, with cogent military and political reasons for building a vast railway line, the Pan-American Railway requires the co-operation of many governments. It requires also the confidence which these must inspire on the part of private capital. But, instead of costing \$400,000,000, with perhaps an additional \$200,000,000 to be expended within a period of five or six years, the Pan-American links, according to the estimates of the engineers, can be brought together for less than one total expenditure of \$200,000,000. It may be said that each of the Central and South American countries has the same political reason for completing within its own links a railway system that the Czar of Russia had for constructing the trans-Siberian line. Beyond this is the common interest which will be promoted by a trunk line and feeders joining three continents. Railway development means commerce, and commerce is civilization. The mightiest factor in South American civilization will be railroad communication.

The Pan-American Railway idea has the support of enthusiasts, but of enthusiasts who have behind them the record of achievement. It is these achievements that give encouragement to the younger generation, who also may catch some of their enthusiasm. When Mr. Carnegie and Mr. Davis, and men of similar persistent purpose, leave the doubters to discuss the obstacles, and give the indorsement of their wide practical experience to the

general plan, others safely may follow them.

There are further measures which preserve the continuity of the idea. The second International American Conference, besides appointing a permanent Pan-American Railway Committee, provided that at a future date an assembly be called of authorized representatives of all the Republics of this hemisphere interested, for the purpose of perfecting a convention to arrange for the construction of the proposed intercontinental

railway. It also provided for the holding of a third International Conference within a few years, when the work that has been done towards carrying out its recommendations may be reviewed, and fresh impetus be given the general policy of drawing the nations of America into closer relation. It is almost needless to mention the sympathetic interest which President Roosevelt and Secretary Hay have shown in this subject, of which the Pan-American Railway is one of the most important elements.

The Heart of the Dream

By Katharine Holland Brown

"THIS is the way." Tom clutched her arm with a lean, eager hand. Harriet looked up at him, keenly anxious. From New York to southern Illinois had been a long ride for a man just up from pneumonia. She put up her hand and stroked his gray young head.

"Hurry slower, Tom. It has waited for you twenty years. Let it keep on waiting a minute longer."

"Just like a girl!" Tom's big-boy laugh rang challenging music through the sleepy orchard. Harriet's cheek burned to rose. When one has married at thirty, petting comes not amiss, even after eight wedded years. "So you're jealous! Jealous of the poor little brier-patch my youth lies buried in! I always did suspect it."

"I'm jealous of every rock and acorn and fence-rail on the place!" snapped Harriet, chin aloft. "You've been telling me of that wonderful woods, and the pasture, and the big brook where you learned to swim, ever since we were married, and you've sighed and languished for them till I've wanted to come out and cuff the Dryad's ears. The hussy! To keep you tied to her apron-strings all these years!"

"It was a good long string, and I had no end of sea-room." Tom pinched her cheek, then laughed again at her face of reproach. "There's not even a chipmunk to see us, child. This isn't Broadway. Come, let's run for it."

A chill of foreboding swept her heart. "Tom!" She caught his wrist and held him back, all too easily. "Have you thought—maybe it won't be the same?"

"Oh, but Jim Burroughs was here last year, on his way through from California; and he said it hadn't changed, not a leaf nor a twig. Don't croak, Harry. Yes, I know; the town is awful." He swept East Clarkesville with a fling of scorn. "Poor Sis, you thought you were coming to classic vales and rural shades, and all that, didn't you? And you found brick walks and automobiles, and all the girls wearing Colonial shoes by mail order, with gilt buckles, and blue ribbon roses in their hair, just like the society leaders up in Chicago. It's too bad. But the real place will make up for it. Ah, it is a real place, Harry. You'll see!"

He scrambled over the low worm fence, then helped her dutifully from rail to rail, with serious regard for her crisp ruffles. Their way led past the orchard down a cool shaded road, all snow-flecked with clover, then up the railroad embankment, steep and glaring in the high spring sun. Harriet trod the hot sand with wary steps; these were her best shoes, and she quailed before the thought of scuffing them. Yet her eyes followed her husband; her breath caught sharply when he stumbled once and wavered a moment before he won his balance again. It was so hard not to help!

"It's right across there." Tom waited for her and pulled her free hand into his own, then dragged her on down the embankment. He laughed out, nervously. Transparent color brimmed the hollow of his cheek. "You're a good girl, and I'm a greedy, to haul you out here on our

machinery is capable of being applied to any of the present packet-ships without any serious suspension of their operation, or any injurious expenditure. If the experiment about to be made shall therefore be attended with that success which we confidently anticipate, a brief period will be sufficient to convert the entire fleet of packet-ships between New York and Britain into steam-liners—uniting in the expedition, certainty, and regularity, with all their present capabilities for commerce and cargo."

ART. VIII.—PROGRESS OF ENGLISH RAILWAYS:

THEIR COST, VALUE, AND DIVIDENDS.

HERAPATH'S RAILWAY JOURNAL, presents some interesting facts relative to the cost, and astonishing travel and traffic on the railways in England. There are already some 2,000 miles of railroad in Great Britain completed, principally in England and Scotland, and but few in Ireland. These roads cost, on the average, about £30,000, (\$150,000,) per mile, or \$300,000,000, and yield an average income of about 5 per cent. Fourteen of the principal railways, 1,367 miles in length, have cost £43,077,348, or £31,512, (\$175,600,) per mile, and are 100 per cent above par.

By a parliamentary report, it appears that at the last session, 112 railway charters were passed. The capital and loans authorised, form a total of £58,452,000, and a length of 2,847 miles. During the previous session, 1844, thirty-one bills for 819 miles of railway were passed, the authorized capital for which was £11,761,717; loans £3,920,570—together, £15,682,287—consequently, the actual expenditures, £60,000,000, with the present authorized railways, £74,136,287, will require the expenditure of the round sum of \$670,000,000. That an estimate may be formed of the immense cost and travel of some of these roads, it is stated that the

	Miles.	Cost.	Per mile.	In dollars.
London and Blackwall,.....	3 $\frac{1}{4}$	£1,078,851	£287,093	1,435,465
London and Greenwich,.....	3 $\frac{1}{4}$	1,031,968	267,270	1,336,350
Passengers, 6,000,000 annually.				

On this cost, the first paid a dividend, the last year, at the rate of 36s per share, or about 1 $\frac{3}{4}$ per cent, and the Greenwich 58s, or near three per cent, for the last twelve months.

The most profitable road in England, is the *Stockton and Darlington*. It cost £2,000,000—\$10,000,000, for 43 miles, and nets its stockholders in regular dividends, 15 per cent per annum, derived principally from the carrying of upwards of 800,000 tons of coal annually, and is £250 for £100.

That an idea may be formed of the cost, travel, and traffic, over some of the English roads, we take the following from the half-yearly returns of the Great Western, extending 119 $\frac{1}{2}$ miles from London to Bristol, with which are connected 102 miles of branches. The whole was completed at an outlay of £7,455,690. The Great Western alone, with motive power and station-houses, cost £6,746,500; of this amount the following are some of the principal items. They must astonish our American readers, particularly the legal and parliamentary expenses to procure the charter, engineering and land damages.

Expenses to procure charter,.....	£89,436		
Expenses of parliament,.....	27,048		
Law expenses and conveyancing,.....	82,443		
		Cost in dollars per mile, for 120 miles, in round numbers.	
Total to procure charter, and law expenses,.	£198,927	£1,658	\$8,292
Land and compensation,	380,641	3,172	15,860
Land-valuers, purchasing land,.....	20,003	166	833
Engineering, surveyors, &c.,.....	156,800	1,306	6,523
Grading for superstructure,.....	3,800,641	31,672	158,360
Permanent way superstructure, and rails,.....	1,121,815	9,348	46,740
Locomotive engines, cars, &c.,.....	547,078	4,558	22,790
Office expenses, salaries, miscellaneous,.....	516,595	4,304	21,520

From this table, it will be perceived, the expenses in parliament to procure a charter, with law expenses, cost \$8,292 per mile; engineering, \$6,533; cost of land for road-bed, or right of way, \$15,860 per mile—a sum that will construct a good railway in the United States; the grading and superstructure, cost the inconceivable sum of £4,022,456, or equal to \$205,100 per mile. The whole cost \$32,732,500, or \$272,770 per mile.

The last semi-annual dividend to July 1, 1845, was 4 per cent, or 8 per cent per annum. The news of this dividend was carried from Bristol to the London stock-holders in two hours and thirty-five minutes or at the rate of 45 miles per hour. The usual time to Exeter, 195 miles—Express line—is four and a half hours. The gross receipts for six months were as follows:—

From passengers,.....	£285,311
mails,.....	32,314
merchandise and parcels,.....	111,422
miscellaneous, rents, &c.,.....	4,249
	£433,296
Expenses,.....	153,367
Nett,.....	£279,829

The number of miles travelled the last year was 70,862,510. The passengers carried, 1,998,088; average daily, 5,462. The gross receipts for six months over this road, is greater in amount than all the tolls received the last year on all the New York state canals, with the salt and auction duties included.

The half-yearly report of the London and Birmingham railway, 112½ miles up to July 1, 1845, declares a semi-annual dividend of 5 per cent, or 10 per cent per annum on a cost of £2,637,753. This road for 112½ miles, shows double the receipts per annum, compared with the canals of New York, of 674 miles in length. The operations of the last half year exhibit an increase of traffic, both in passengers and goods, and a considerable excess of receipts over the corresponding period of 1844, notwithstanding the large reductions which have since been made in the rates and fare of this company, amounting, on an average, in pence and decimals, per mile,

	1844.	1845.
Passengers.....	2,609	1,818
Freight, tons,.....	2,816	2,606

The total mileage of passengers was 35,758,260 during six months in 1845, against 24,664,979, the corresponding months of 1844, or 57 per cent increase. The total mileage of goods was 9,350,718 tons against 6,929,885, being an increase of 35 per cent.

The gross receipts 6 months in 1844 were £405,768
do do 1845 " 447,190

Receipts from passengers,.....	£293,707
do Mails,	7,445
do Merchandise, £98,859; parcels, 25,826; }	145,883
do cattle and horses, 21,153..... }	

The number of passengers taken over this road the last year was 1,096,271; daily, 2,997; equal to the average of through passengers, 1,705.

The maintenance of way, repairs of bridges and station-houses, engineers salaries, office-charges, &c..... £24,142

Locomotive power, wages to engine-drivers and foremen £5,994,
Coke fuel £18,460; repairs to engines and tenders £8,340;
wasted oil, £2,414; labor, stationery engines, &c..... 43,161

Police charges,..... 6,667

Coach traffic charges,..... 17,517

Coach repairs, 6,083

General charges,..... 11,036

Parish-rates and tax,.....£12,613

Duty on passenger traffic,..... 13,029

—25,642

Reserve for deprec'n of locomoti. and cars 15,498 41,140

£149,748

The following view of the principal railways of England and Scotland, is compiled from the August number of Herapath's Railway Journal :—

Name of Railway.	Miles.	Cost.	Value of stock.	Dividend.
Great Western, and branches,.....	221	£7,455,690	232	8 per ct.
Liverpool and Manchester,.....	31	1,698,628	214	10 "
London and Birmingham,.....	112½	6,614,996	250	10 "
Grand Junction,.....	119	2,477,701	248	10 "
Stockton and Darlington,.....	43½	2,000,000	250	15 "
Midland,.....	271	6,259,838	178	6 "
Manchester and Leeds,.....	86	3,293,716	202	7 "
Eastern Counties,.....	83	4,010,910	100	3½ "
Great N. of England,.....	45	1,237,487	.....	6 "
London and Southwestern,.....	93	2,604,406	166	9 "
Newcastle and Darlington,.....	56	506,788	216	6 "
Newcastle and Carlisle,.....	60	1,070,232	116	5 "
Southeastern, just finished,.....	98	3,739,810	.....	3½ "
York, N. M. and Leeds,.....	48	1,107,146	220	10 "

Total,..... 1,367 £43,077,348=£31,512 cost per mile.

The whole cost of 1,367 miles, £43,077,348—equal to \$157,560 per mile. The other short roads varying in their dividends from nothing up to 8 per cent, the average dividends on 2,000 miles of road that have cost £60,000,000, yields about 5 per cent dividends, while the enhanced value in the market is not short of \$200,000,000.

Ireland is commencing the railway system in earnest. The Dublin and Drogheda railroad, 31 miles, pays 4 per cent on its great cost. The Dublin and Kingston, 9 per cent on £354,733 for six miles. France is pressing forward her railways to connect the Atlantic and British channel with the Mediterranean. Her capitol, with Brussels, Antwerp, Vienna, and finally, Warsaw, St. Petersburg, and the Black sea, while a

road from Paris, through Spain and Portugal, to Lisbon, is projected, and will no doubt be completed, thus forming the great band to unite and maintain Europe in a state of peace, by making each nation dependent on the other, for the interchange of commodities, produced by inland commerce; a traffic the most productive to the wealth and advancement of nations, during a state of peace, which the construction of railways tends to perpetuate. That railways will tend to bind in indissoluble iron bands, the union of these United States, and extend the Anglo Saxon race to the Pacific ocean, there can be no question. For defence they are invaluable. To regulate our exchanges, the best bank. Without them we cannot have the cheap postage system, yet the general government is parsimonious, and it would appear, ignorant of the cost of yielding them this mode of rapid transit for the mails. Railway companies are abused as extortionate, &c., and yet the Post Master General is not authorized by Congress to pay per mile per annum, half the rates paid in England, from a uniform postage of one penny per half ounce from one end of the kingdom to the other. The error on this subject should be corrected. Now that railways in the United States are generally weak and struggling with pecuniary difficulties, to extend and connect the detached parts, the general government should step in, or for the privilege and right, in the several states, of carrying the mails, troops, and munitions of war, *on preferred terms*, as to price. The people could well afford to pay about \$3,000, per mile, or the interest of this sum, for this privilege, where roads are completed and in use. Without something of this kind is promptly done by the next Congress, it is to be feared, that combinations of private enterprise, aided by state authority, and state cupidity, may nullify all attempts on the part of the general government, to procure rights in the main sea-board lines, and into the interior, through the several indebted states, who may, like New Jersey, tax them for the privilege of transit.

J. E. B.

MERCANTILE LAW DEPARTMENT.

MERCANTILE LAW CASES.

BILL IN EQUITY TO RESCIND A PURCHASE OF REAL ESTATE.

In the United States Circuit Court, (Boston, Mass.,) *Veazie v. Williams, et. al.*

This was a bill in equity, brought to rescind a purchase of mills, made by the plaintiff at auction, on the ground of fraud committed by the auctioneer, as the agent of the defendants, in bidding against the plaintiff, and thereby inducing him to give more than its value for the property. It appeared that the sale was in January, 1836. The defendants, who lived in Boston, were the owners of certain mills in Oldtown, near Bangor, in the state of Maine, which were supposed to be worth \$14,000 or \$15,000. A Mr. Head was employed as an auctioneer to sell the property for the defendants. Mr. Veazie, the plaintiff, and a Mr. Wadleigh, who were mill owners, living near by, were each anxious to buy the mills in question, and felt a spirit of rivalry to obtain them. They were struck off to Foster, who was the agent of Mr. Veazie, and who bid for him, at \$40,000. Mr. Veazie adopted the contract, paid down \$12,000, and gave two notes for \$14,000 each, payable one in one year, and one in two years, for the balance. The first of the two notes was paid, and interest paid on the other until 1840. The defendants were not present at the sale, knew nothing about any by-bidding, and had given no directions to the auctioneer or any other person to bid for them, but had in fact expressly forbidden it. Wadleigh had authorised Head to bid for him, as

300,000 tons of coal. If one half that stock should be drawn into the State, instead of paying away \$600,000 per annum for nothing, the value would be retained in the State and accumulate its resources yearly, adding to its taxables and lightening the general burden. It would seem, however, as is usually the case when they prevail to any extent, that chartered influences are too strong to allow of any movement that militates against their interests, more particularly as appears to be the case, that the interests of the stockholders are not strongly represented in the State—a fact recognizable in the payment to them of the relief notes and taxing the debt.

It is to be observed, that the immense losses and expenditure of the State of Pennsylvania to develop her resources, have been of very little avail. As, for instance, her coal trade has grown up from nothing in 1825, to 3,000,000 tons per annum. Of this vast amount, but 192,511 tons came to Philadelphia upon the State works; the Union, Lehigh, Schuylkill and Delaware canals, and the Reading Railroad, all private works, delivered the remainder.

Art. III.—THE PROPOSED RAILROAD ACROSS THE ISTHMUS OF PANAMA.

THOSE who have read the *Cosmos* of Baron Von Humboldt, must be deeply impressed with the novel, striking, and very interesting views there presented of the future progress and development of civilization in this country, as dependent upon and connected with the physical features of the vast continent we inhabit.

Without startling our practical readers with opinions that appear to be merely speculative or theoretical, (however true and pleasing we may regard them,) we will remark that it cannot escape the notice of the most superficial observer, that there must necessarily be a great dissimilarity between the wants, resources, means, and appliances of two people equally advanced in knowledge and the arts, one of whom exists in a compact and closely settled community, while the other inhabits a country of immense extent and of unbounded resources, the greater portion of which still remains to be conquered from the rude hand of nature. The most hasty glance at our present condition will suffice to satisfy the mind as to the real dependence of our national progress, both in form and amount, upon certain prominent and characteristic geographical peculiarities, such, for instance, as the broad and deep lakes of the North, the interminable rivers of the West, the lofty mountains of our central States, and the fertile savannahs of the South. It is undoubtedly true, that viewed in relation to these controlling causes, to favor the operation of which we seem to be eminently adapted by our spirit of enterprise, equally bold in conceptions and execution, the future development of society in the new world, offers to the contemplative mind the widest field of expectation and of wonder.

We already witness many striking effects of those causes. To some of them we have made a passing allusion. Another of these effects, and one immediately connected with the subject before us, is the character of those undertakings, whether public or private, by which the means of intercommunication, for the purposes of trade and travel, are established between remote parts of our territory. This character becomes more marked and peculiar, as the population of the country, and consequently its wants, are increased and ex-

tended. To meet these wants, and to bring out, in a form of practical utility, the hidden means by which they may be supplied, there is never wanting some bold and ingenious mind that sees the true connection of things however apparently distant, and is ready to propose a scheme of improvement, by which that connection may be established.

A ready example of this occurs to every one in the junction of the Northern Lakes with the Atlantic ocean, and in the name of De Witt Clinton, the author of this project, from the execution of which his name has received a great and enduring fame. But such projects will always encounter, in their beginning, the opposition of less ardent and enterprising minds. They are, in fact, somewhat in advance of their time; and we, who read the history of their slow progress towards completion, have to admire no less the Antean vigor with which their authors rise up after occasional defeat, than the grandeur of the schemes themselves, so far outstripping the calculations of ordinary men.

It is worthy of remark that such grand projects rarely have their origin in the scenes of business, and of merely practical life. Commerce is a science, as well as an art—and it is not to be expected that those whose attention is engrossed by plans of individual profit and advantage, or by the multiplied and complicated details of the counting room, should always be possessed of the taste and leisure for studying the principles upon which their art is founded. Accordingly, the whole history and literature of commerce show that those ideas and rules of action that regulate the commercial intercourse between nations, those combinations and discoveries that open new channels of trade, and those theories that comprehend and explain the laws and principles of commerce, are derived from the man of thought and reflection—from the political economist, whether a student in his closet, or a statesman in office.

In the report of Mr. T. Butler King upon the RAILROAD ACROSS THE ISTHMUS OF PANAMA, which we intend to lay in a brief manner before our readers, we see the final step in the achievement of a great undertaking, precisely similar in character to those of which we have just spoken.

When Mr. King first brought forward his plans for a system of mail steam packet communication between New York and Chagres, and between Panama and Oregon, he was compelled to invite private enterprise by offers of assistance from the government, to secure the co-operation of government by urging the great and serviceable addition that these vessels would prove to the naval force of the country in time of war, and to overcome the opposition of his associates in Congress by arguments and persuasions addressed to their pride, their interest, and their local connections. He foresaw that this railroad was sooner or later to follow as the consequence of the mail packet system—that it would very soon be perceived that the chain of communication (to use the common figure) wanted yet a single link to be complete—and that the argument at present applied with so much force, “we have now established a steam communication on the water between New York and the Columbia river, but in order to make it perfect we must have some easy, certain, rapid, cheap, and permanent means of transit across the isthmus, without which our lives are subject to great expense, irregularity, and inconvenience,”—that this argument, so valid and so obvious, would be immediately stated.

The enterprise, which, a few years since, was regarded by many as one of doubtful utility, and at least as being a little premature, is likely to prove one

of the most magnificent schemes of the age, and we congratulate the author of it upon his well deserved success and honor.

But in the report before us, Mr. King has advanced far beyond his former position, (in respect, we mean, to this route across the isthmus,) by presenting some new and very remarkable views as to the effect of this road upon the general commerce of the world, of which it is to make this nation the great central seat and agent. These views, like those of Mr. King upon steam communication with China, are founded upon commercial statistics, collected with industry, and compared together with originality. From their combination, and a study of their common relations, Mr. King has been led to the discovery of new laws and channels of trade; and if the experience of the future should establish the correctness of those principles of commercial intercourse which he has been the first to announce, his name will be hereafter permanently associated with an important epoch in the commercial history of this country.

We will proceed to give a brief synopsis of the report.

It is based upon a memorial of Wm. H. Aspinwall, John L. Stephens, and Henry Chauncey, praying for aid from the government of the United States to construct a railroad across the Isthmus of Panama. The memorialists have procured a charter from the government of New Grenada, (originally granted to a French company, but afterwards forfeited,) which secures to them very extensive privileges on the isthmus, provided the work shall be completed within eight years, and be commenced within eighteen months from the date of their grant. The memorialists are unwilling to engage in a work of such magnitude, and so remote from our own borders, without efficient aid from the government; and the object of Mr. King in his report is, to show that it is the wise policy to extend such aid, and to point out the very striking practical benefits that are certain to result from the construction.

The first step in the course of the argument is to mention a fact, explaining the superior advantages possessed by Great Britain over ourselves, and other nations, by means of her maritime position. This part of the report is too interesting to be abbreviated.

"Great Britain is principally indebted to her skill in commerce and manufactures for her commercial ascendancy, but she is also indebted in no small degree to her *position*. She not only has the ports of the continent of Europe as her neighbors, but she is *fifteen hundred miles*, or two weeks, nearer than we are to *all the other ports of the world, except the Atlantic ports of the American continent north of the equator and the West Indies*. The cause of this is, that all vessels bound from our ports to places south of the Line, or beyond either of the capes, cross the Atlantic to the Azores or Western Islands, for the purpose of finding favorable winds, while vessels from British ports run down to the same latitude and longitude without the necessity of crossing the ocean, to avail themselves of the same advantages. This difference in favor of British commerce, running through our entire existence as a nation, has been a most serious obstacle for our merchants and navigators to contend with, and has of itself been a vast item in favor of the profits on British capital. Lieutenant M. F. Maury, superintendent of the Observatory, has, within two or three years past, proposed a more direct route for vessels bound from our ports to ports on the Atlantic side of the American continent, south of the equator and beyond Cape Horn, which will save about one thousand miles of the distance to those places, but all vessels bound round the Cape of Good Hope will be compelled to pursue the old route.

TABLE SHOWING THE SAILING DISTANCES FROM NEW YORK AND LIVERPOOL TO THE PRINCIPAL PORTS BEYOND OR AROUND CAPE HORN AND THE CAPE OF GOOD HOPE.

	From Liverpool.	From New York.
To Calcutta via Cape of Good Hope . . miles	16,000	17,500
" " Horn	21,500	23,000
Canton " " 	20,000	21,500
" " of Good Hope	18,000	19,500
Valparaiso via Cape Horn	11,400	12,900
Callao " 	12,000	13,500
Guayaquil " 	12,800	14,300
Panama " 	14,500	16,000
San Blas " 	16,300	17,800
Mazatlan " 	16,500	18,000
San Diego " 	17,000	18,500
San Francisco " 	17,500	19,000

"The construction of the proposed railroad across the isthmus will not only do away this advantage over us, now possessed by European commerce and navigation, but will turn the tide in our favor.

"The average distance from Liverpool, London, and Havre, to Panama, is four thousand seven hundred miles; from New York the distance is two thousand miles; from Charleston one thousand four hundred; from Savannah one thousand three hundred; from New Orleans and Mobile one thousand six hundred; making an average distance from our principal exporting Atlantic and gulf ports of about one thousand six hundred miles to Panama. If, therefore, we admit, for the sake of the argument, that European commerce with the Pacific ocean, the East India and China seas, will take the new route across the isthmus—these will be a difference of three thousand one hundred miles in our favor. Add to this the one thousand five hundred miles now against us, and we find that we shall gain by this channel of communication, in our relative position to those parts of the world, a distance of four thousand six hundred miles, or of forty-two days. *In the voyage out and home* we shall have the advantage of our European competitors of nine thousand two hundred miles, and eighty-four days, as compared with the present route."

The gain to us in time and distance, here stated, is limited by the supposition that European ships will carry their own goods as much as formerly, intended for the Pacific markets, and will go freighted to the eastern terminus of the proposed railroad. That, however, adds Mr. King, will not be the case.

On the contrary, "the large number of vessels bound to the ports of the United States for cotton, rice, tobacco, lumber, flour, provisions, &c., will bring the freights for those markets as ballast or cargoes, whence they will be conveyed to the railroad in our own fast-sailing coasting vessels and steamers, which will also bring to us the commerce of the Pacific. This is very obvious, because, if European ships were to sail with full cargoes direct to the railroad, they would run the risk of being compelled to return without freight, or come to the United States for it. We are so much nearer to the isthmus than the ports of Europe, and our means of communication and information will be so frequent and certain, our lines of steamers and coasting vessels so constantly on the alert, and will move with such celerity, that heavy European freighting ships will find it quite impossible to compete with them. If this view of the subject be correct, and we believe it is, the construction of this railroad will throw into our warehouses and shipping the entire commerce of the Pacific ocean. Our ports are on the very way-side from Europe to the Isthmus of Panama, and our lines of steamers and packet ships across the Atlantic will come laden with the freights destined for that channel of trade. The commerce, therefore, from Europe to the East Indies, China, and the west coast of this continent, will be forced to pursue the old route or fall into our hands. The following table shows, stronger than language could express it, the saving in distance and time which will result to our commerce from the

completion of this work, and the advantage it will give to us over our commercial rivals.

	New route from New York.	Old route from New York.	From Liverpool.
To Calcutta via... Cape of Good Hope....miles	....	17,500	16,000
" Horn .....	....	23,000	21,500
Isthmus of Panama.....	13,400	.....	.....
Canton via.... Cape of Good Hope.....	....	19,500	18,000
" Horn.....	....	21,500	20,000
Isthmus of Panama.....	10,600	.....	.....
Shanghae via... Cape of Good Hope.....	....	20,000	18,500
" Horn.....	....	22,000	20,500
Isthmus of Panama.....	10,400	.....	.....
Valparaiso via.. Cape Horn.....	....	12,900	11,400
Isthmus of Panama.....	4,800	.....	.....
Callao via..... Cape Horn.....	....	13,500	12,000
Isthmus of Panama.....	3,500	.....	.....
Guayaquil via.. Cape Horn.....	....	14,300	12,800
Isthmus of Panama.....	2,800	.....	.....
Panama via.... Cape Horn.....	....	16,000	14,500
Isthmus of Panama.....	2,000	.....	.....
San Blas via... Cape Horn.....	....	17,800	16,300
Isthmus of Panama.....	3,800	.....	.....
Mazatlan via... Cape Horn.....	....	18,000	16,500
Isthmus of Panama.....	4,000	.....	.....
San Diego via.. Cape Horn.....	....	18,500	17,000
Isthmus of Panama.....	4,500	.....	.....
San Francisco via Cape Horn.....	....	19,000	17,500
Isthmus of Panama.....	5,000	.....	.....

"These figures show that the new route across the isthmus will bring us more than an average of ten thousand miles nearer to the East Indies, China, and the ports of South America on the Pacific, and will actually, for all the purposes of navigation and commercial intercourse, bring the ports of the west coast of Mexico, California, and Oregon fourteen thousand miles nearer to us than they now are! With steamers on each side of the isthmus that will go fifteen miles an hour—a speed ascertained to be quite practicable—passengers, the mails, and small packages of light and valuable goods may be conveyed from New York to San Francisco in fourteen days, and from our southern ports in less time. Thus bringing these remote points, for all practical purposes, nearer than New York and New Orleans were twenty years ago.

"The average saving of time in our commercial intercourse with the west coast of America, China, and the East Indies, which will be effected by the construction of the proposed railroad, is exhibited in the following table:—

TABLE SHOWING THE SAVING OF TIME FROM NEW YORK, BY THE NEW ROUTE VIA THE ISTHMUS OF PANAMA, AS COMPARED WITH THE OLD ROUTES VIA CAPE HORN AND THE CAPE OF GOOD HOPE, TO THE PLACES THEREIN NAMED, ESTIMATING THE DISTANCE WHICH A COMMON TRADING SHIP WILL SAIL PER DAY TO BE ONE HUNDRED AND TEN MILES, AND CALCULATING FOR THE VOYAGE OUT AND HOME.

	1. Miles.	2. Days.	3. Miles.	4. Days.	5. Miles.	6. Days.	7. Days.	8. Days.
To Calcutta.....	17,500	318	23,000	418	13,400	244	74	174
Canton.....	19,500	354	21,500	390	10,600	192	162	198
Shanghae	20,000	362	22,000	400	10,400	188	174	212
Valparaiso.....	....	...	12,900	234	4,800	86	...	148
Callao.....	....	...	13,500	244	3,500	62	...	182
Guayaquil.....	....	...	14,300	260	2,800	50	...	210
Panama.....	....	...	16,000	290	2,000	36	...	254

1. Distance via Cape of Good Hope. 2. Length of passage out and home. 3. Distance via Cape Horn. 4. Length of passage out and home. 5. Distance via Isthmus of Panama. 6. Length of passage out and home. 7. Saving via the isthmus over the route via Cape of Good Hope, out and home. 8. Saving via the isthmus over the route via Cape Horn, out and home.

To San Blas.....	17,800	322	3,800	68	...	254
Mazatlan.....	18,000	326	4,000	72	...	254
San Diego.....	18,500	336	4,500	82	...	254
San Francisco.....	19,000	344	5,000	90	...	254

"The employment of steam vessels would render the contrast in our favor still more striking. But the difficulty and expense of transporting heavy merchandise across the isthmus *in its present state*, and the distance round the capes, render the employment of steam in *the carrying trade* to the East Indies, China, and the west coast of America, quite impracticable. The most that can be done is to employ steam packets in the conveyance of the mails and passengers. Let this railroad be completed, however, and no part of the world will present as great advantages for the successful use of steam in ocean navigation as the Pacific. Coal is found on all its borders, both American and Asiatic, in the greatest quantity and perfection. Its quiet waters seem to indicate steam as the proper agent to be employed in their navigation. The spirit and genius of the American people, and the extent of our territory on the west side of the continent, proclaim clearly enough that we are to become the legitimate heirs of a vast commerce that shall spread fleets of steam ships over the bosom of this peaceful ocean.

"Steamers, with a speed of twelve miles an hour, would go from New York via the isthmus, (throwing out the fractions)—

To Calcutta in.....days	47	To Panama in.....days	7
Canton in.....	36	San Blas in.....	12
Shanghai in.....	35	Mazatlan in.....	14
Valparaiso in.....	17	San Diego in.....	16
Callao in.....	12	San Francisco in.....	*18
Guayaquil in.....	9½		

We need make no apology to our readers for the length of this extract. It sufficiently recommends itself by the originality of its conceptions, and the logical clearness with which they are presented. It opens in prospect, and not a distant one, the commercial resources and means of wealth and enterprise, which are eminently suited to build up the power of this vast empire, and to hasten the time when it shall become the foremost nation of all the world, taking the place that is rightly due to its physical condition, to the character of its people, and to its free institutions.

And Mr. King suggests that it may have been owing to the sagacious discernment of this result, that European capitalists have refused to lend their aid to the accomplishment of an undertaking which will not only deprive them of the decided superiority they now possess over us in their intercourse with nine-tenths of the world, exclusive of ourselves, but will place us so far ahead in the race for commercial supremacy, that we can never be overtaken.

Mr. Alexander Forbes, in a work on California, published in London as far back as 1839, quoted by Mr. King, dwelt upon the favorable situation of that country for intercourse with other nations, and its capacity for commerce, should it ever be possessed by a numerous and industrious population.

"California has now been added to our territory on the Pacific. Its beautiful and commodious harbors, its delightful climate, the fertility of its soil, and its mineral wealth, are attracting thousands and probably tens of thousands of our fellow citizens to it. The most rapid means of communication should be established to facilitate their emigration, protect them in their new homes, supply their

* We are reminded here that some studious and zealous critics have objected to the length of some of the passages as given in Mr. King's tables. Though we have entire confidence in the sources of information on which Mr. King has relied, yet we are not at all careful to answer in this matter, since the corrections of these ingenious persons, even if fully admitted, are too trifling in the slightest degree to invalidate Mr. King's argument, which we may not uncharitably suppose to be less congenial to such minds than the barren statistics on which it is based.

wants, and to enable them still to participate in the blessings of our free institutions. They will be large consumers of our manufactures of every description, and for some years to come, at least, of our agricultural products also.”—(P. 7.)

From what we see at present we may expect that mining operations, and not agricultural pursuits, will form the almost exclusive occupation of the inhabitants for many years to come, during which they will depend upon others for their supply of food, as well as of articles of manufacture. If our ships still continue to take the circuitous route round Cape Horn, it will be impossible for us to compete with Chili, Peru, and other adjacent ports, in providing for the markets of California, flour, and other perishable articles. This is brought forward by Mr. King, as being of itself a strong reason for aiding in the construction of the proposed road. He points out the great superiority we shall gain by the diminished cost of transportation, not only in the markets of California, but in those of the whole Pacific; and he applies here the fundamental maxim in trade, that a diminution in the cost of transportation, is equivalent to a diminution in the cost of production.

But, without dwelling upon this, we pass now to the consideration of another novel and striking idea, as to the effect to be produced by this railroad upon the general commerce of the world, and of the manner in which this result is to be obtained. We shall let Mr. King speak for himself:—

“We have already spoken of the commanding position which Great Britain occupies in the commercial world, and we deem it proper to remark still further on the advantages she has derived from it. At an early day she adopted the warehousing system. This enabled her own merchants and those of all other countries to place merchandise in bond, for consumption or exportation. It has been equally beneficial to her commerce and manufactures.

“While it has exempted the merchants from paying duties on importations beyond actual consumption, it has enabled them to make up, with home manufactures and foreign commodities, assorted cargoes for all parts of the world. Foreigners have thus been induced to place immense amounts of merchandise in bond, that they might have the double advantage of consumption or re-exportation.

“The manufacturer has thus been enabled to allow the raw materials, necessary to his pursuit, to remain in store until required for use, without being burdened with the payment of large sums in duties on importations not immediately wanted. *A vast supply has thus been constantly held, at the expense of the foreign producer.*”

To support this view, tables prepared with evident care and labor are inserted in the body of the report, showing the quantities of a long list of articles of foreign growth and production, in the bonded warehouses of London, Liverpool, Bristol and Hull, on the 5th January, 1832 and 1833; and the quantities and official value of articles of foreign growth and production re-exported from, compared with the official value of the total imports into, Great Britain, from 1831 to 1844.

“The great variety and amount of articles constantly on hand in the British warehouses, as shown in these tables, for domestic consumption—the supply of her commerce and manufactures—is truly surprising. It will be seen that more than *one-fifth* of all the imports are re-exported, and that if the whole amount of duties payable had been exacted, her merchants would have been required to pay more than two hundred and eighteen millions of dollars on *five* articles alone, from which they were relieved by the warehousing system.

“The total value of articles imported into the United States in 1848, was \$154,977,876. The value of articles re-exported was \$7,986,806. Thus it will be seen that *we* re-export but a little more than *one-twentieth* of our imports, and that the re-exportations from Great Britain are nearly five times larger in proportion to her imports than ours, and are actually *nine* times larger than ours. Now,

if by the construction of the proposed work we give such a direction to the course of trade as to bring us almost in a central position between Europe and Asia, it seems impossible to resist the conclusion that our warehouses must become the great depots and our cities the marts of modern commerce."—(P. 14.)

We have not left ourselves any room to speak of the terms of our recent treaty with New Grenada, or of the bill accompanying Mr. King's report. We can only say of the former, that it amounts to a defensive league on our part, by which we virtually guarantee the sovereignty and independence of New Grenada for a period of twenty years; and of the latter, that it is prepared with great care and forethought, and provides that at least seven-eighths of the stock shall be owned by citizens of the United States.

The services to be rendered by the contractors in return for the pecuniary assistance received from the government, will exceed by many fold the amount it advances.

The rapid settlement of California, and the character and pursuits of its people, will soon render the efficient interposition of the government necessary, and the frequent transportation of agents, and of military stores, and men must inevitably take place.

We have also seen recently in the public prints a letter from Commodore Jones, commanding the squadron in the Pacific, in which he recommends to the Secretary of the Navy that our ships of war should be refitted in California, by which their long absence from a station where they constitute a most important and efficient police will be prevented, and the great delay and expense of the tedious voyages round Cape Horn and back be saved. This is so palpably a measure of economy and policy, that it cannot fail to receive the sanction of the department controlling the navy. And here we have at once, in the transportation of materials, stores, and persons required to establish a naval depot in California, and to relieve from time to time the officers and crews of our different ships of war, a mode by which the government will be fully reimbursed for its proposed expenditures.

But it must not be thought that it at all enters into the views of Mr. King, that this mode of communication with California is to dispense with the future construction of a railroad from the valley of the Mississippi to the borders of the Pacific Ocean.

This road, which is equally demanded by public opinion and public policy, must sooner or later be made. We rejoice to see that the mind of the nation is already so fixed upon it, that the *commencement* of this great undertaking may be regarded as not very distant. And much, we conceive, will depend upon the manner and direction in which it is begun. It should, as a matter of obvious policy, take such a course as to pass through lands the best adapted for immediate settlement, either by their fertility or their mineral wealth; and then it will accomplish more rapidly the universal effect of railroads, to create population along their line.

If it be begun at both extremities of the line simultaneously, and this rule of direction be followed, the public lands through which it passes will be brought into market under very profitable conditions, and their sale from year to year will very soon be sufficient to meet the expenses of the year in construction. And this rapid settlement will also in time give rise to the by-travel, which is found, even on the main routes, in the old States, to be indispensable to the support of railroads, in the expensive and handsome style in which they are maintained, at least at the North.

We have dismissed all anxiety as to the accomplishment of this great un-

dertaking, and now our thoughts are turned chiefly to the examination of the various plans offered to the public, concerning which we may have something more to say hereafter.

There is one effect following the completion of this railroad across the isthmus, (or any other mode of easy communication between the two oceans,) that is too striking to be omitted. Since the earliest application of steam to navigation, the question has often been discussed, as to how far this motive power would be eventually employed for the general purposes of commerce, to the exclusion of sails; and it has hitherto appeared to be requisite that science should bestow upon the arts some new method of generating heat more economical and compact than the present one, before steam could be generally introduced on the ocean. A long time elapsed before the English steamers ventured across the Atlantic, notwithstanding the experience gained by their sea-practice on their own shores, and on the coasts of Europe. Yet it must be remembered that the English, having no great inland water communications like ourselves, were compelled by their position, if they built steamers at all, to build sea steamers, and to this fact, and this only, it is owing, that they have taken precedence of us in the construction and management of sea steamers—a precedence which, we may incidentally observe, we shall soon be prepared to dispute, to which it does not become the maritime genius of our people to submit, and the loss of which is only delayed, not prevented, by a few failures in the beginning, such as might be reasonably looked for in new enterprises, particularly among an inventive people not disposed to copy tamely after others.

With all the improvements in machinery, and economy in the use of fuel, which have so astonishingly marked the progress of steam navigation, its common routes are still limited. It is only for distances not exceeding a certain extent, that steam can be advantageously employed.

The use of steamers between the great marts of commerce on both sides of the North Atlantic, and those in the North and South Pacifics, if thought of, has not yet been projected. But the direct and immediate effect of the construction of the proposed road is to bring these markets within reach of each other by means of steam navigation. We are well aware that, for many reasons, it is neither desirable nor possible that the ordinary channels of trade should be too suddenly closed or altered.

The vital circulations of commerce are not to be rudely or unadvisedly interrupted. But in this instance, the effect is to create new channels without destroying the old ones—to open new avenues to enterprise and wealth, and to supply new means of providing for those unforeseen necessities and wants which have sprung from the recent discoveries in California.

It is by such views and reflections as are here presented, that we have been led to regard the construction of the proposed and long thought of railroad as a pregnant event in the history of commerce. It is hardly necessary to declare that we do not speak of this road as the only, or even the best, mode of transit between the two oceans. With respect to others, as, for example, that across the Isthmus of Tehuantepec, we wait to have the deliberate opinions of engineers concerning the feasibility of the excavations, &c., of hydrographers concerning the capacity, safety, and facilities of approach, of the harbors on each side; and we should also be glad to learn the opinion of geologists concerning the alluvial formation of these shores, and the laws of deposit under which it takes place—for it would be a serious objection to

such a gigantic undertaking that it must begin by a contest with the operation of the fundamental laws of nature.

At the same time that we are prepared to treat this, and all similar projects without prejudice, and to discuss their merits fairly, we see in the one, of the railroad across the isthmus, the only present practicable plan, the only one that can be commenced without delay, the merits and defects of which have been long known and thoroughly examined, and the only one in which capitalists are willing, with sufficient encouragement, to embark immediately.

As there is no subject more important than this, (of constructive communication between the two great oceans,) or more intimately connected with the purposes for which this journal was established, we shall endeavor, from time to time, to keep our readers acquainted with the progress of opinion, and of events in relation to it.

Art. IV.—COMMERCIAL CITIES AND TOWNS OF THE UNITED STATES.

NUMBER XV.

DETROIT, MICHIGAN.*

ITS LOCATION ON THE DETROIT RIVER, AND DESCRIPTION OF THE RIVER—THE DEPTH, WIDTH, CURRENT, AND NAVIGATION OF THE RIVER, AND A COMPARISON OF ITS RISE AND FALL WITH THE FLOODS IN SOME OTHER LARGE RIVERS—SETTLEMENT OF DETROIT, AND NUMBER OF ITS INHABITANTS AT DIFFERENT PERIODS—ITS RAILROADS, AND FACILITIES FOR COMMERCE—ITS STORES, DWELLING-HOUSES, HYDRAULIC WORKS, CHURCHES AND PUBLIC BUILDINGS, AND THE GREAT NATURAL CURIOSITY PRESENTED BY THE UNITED STATES BUILDING—MANUFACTURES OF LUMBER—SHIP-BUILDING—FOUNDRIES—MACHINE-SHOPS, ETC., ETC., AND ITS ADVANTAGES AND FACILITIES FOR MANUFACTURING BY STEAM.

THE city of Detroit is pleasantly situated on the north-westerly side of the Detroit River, or Strait, extending along the river more than a mile and a half, the centre of it being about seven miles from Lake St. Clair, and eighteen miles from Lake Erie, in north latitude $42^{\circ} 20'$, and west longitude from Washington city $5^{\circ} 56'$. The river runs from Lake St. Clair, to a point about two miles below the city, in a direction about 30° south of west, and from thence it runs nearly south to Lake Erie. The original bed of the river opposite Detroit, and for a mile above, and about three miles below, varied from about 48 to 52 chains in width, averaging about five-eighths of a mile; the width from the docks of Detroit to the opposite docks of Sandwich being about half a mile. Lieutenant M'Comb, of the United States Army, carefully sounded and surveyed the river in the summer of 1841, and measured its depth and current in numerous places, and at different times. The depth between the docks in June, 1841, varied from about twelve to

* The following article was prepared for the Merchants' Magazine by EZRA C. SEAMAN, Esq., a member of the Detroit Bar, and the author of an elaborate work entitled "Essays on the Progress of Nations in Productive Industry, Civilization, Population, and Wealth; illustrated by Statistics of Mining, Agriculture, Manufactures, Commerce, Banking, Revenues, Internal Improvements, Emigration, Mortality, and Population." This work is embraced in a volume of some six hundred octavo pages, and contains a vast amount of important information, forming altogether one of the most valuable contributions that has yet been made to the literature and statistics of political economy. We should not, perhaps, agree in all the inferences and conclusions of the author, but his work is highly suggestive, and exceedingly valuable as a book of reference.—*Ed. Merchants' Magazine.*

Annals of Amer. Acad.
Jan. 1900

RAILWAY DISCRIMINATIONS AND INDUSTRIAL COMBINATIONS.

In testifying before the Industrial Commission upon the subject of transportation, I made some observations upon the effect of rate discriminations in the building up and perpetuating of trusts and monopolies. It has been intimated that if what was there said could be put into some coherent form, it might not be without interest as a trifling contribution to a most interesting social problem.

Few people have any adequate conception of the importance, in a commercial way, of slight changes in the freight rate. Not long ago the railroads centering at Chicago imposed a terminal charge of two dollars per car upon every carload of livestock delivered at the stock yards in that city. The matter having been brought before the Interstate Commerce Commission, this charge was declared to be unlawful and the carriers were ordered to desist from imposing it. They declined to obey and proceedings were begun in the courts for the purpose of enforcing this order. The judge before whom the case came, while sustaining at a preliminary stage of the proceedings the action of the Commission, suggested a doubt whether the relief sought was after all of much consequence.

This terminal charge, applied to all the carloads of livestock entering Chicago during a single year, aggregates about \$500,000, and this amount is collected year after year. The courts of that metropolis are continually called upon to decide cases involving large sums of money, but seldom have they, or will they, pass upon one of greater pecuniary importance than is the question whether the imposition of this trifling switching charge of two dollars per carload is lawful.

Recently the Commission decided that grain rates from a certain limited section of the State of Iowa were too high,

and that they should be reduced from two to three cents per hundred pounds. The first thought is, of what practical value can this be to the grain producers of that section? Yet a moment's consideration will make it plain that it is in fact of great importance to the farmer. Without inquiring what effect a general reduction in grain rates might have upon the price of grain, it is evident that a reduction from a circumscribed area must operate to raise the price by exactly the amount of the reduction. Grain in this section would be worth from one to two cents per bushel more with the reduced rate in effect than it otherwise would. The testimony in that case showed that the average yield of corn was some thirty bushels per acre. The net money product of every acre of corn land would therefore be increased by this reduction in the rate from thirty to sixty cents, which upon a six per cent basis means a difference of from five to ten dollars per acre in the value of such land in that vicinity.

These two examples, which might be indefinitely multiplied, sufficiently illustrate the fact that a change in rates, which when applied to a single article or a single hundred pounds would be insignificant, is when applied to the entire volume of traffic which it concerns of the highest importance.

Along with this must be kept in mind another fact, which is perhaps of even more fundamental consequence in the examination of the particular question under discussion, and that is the extremely narrow margin upon which business is transacted at the present day. Some recent investigations of the Commission have presented this in a most striking light. Flour is to-day ground in this country upon a margin of two or three cents per hundred pounds, from four to six cents a barrel. Coal in large quantities is handled from the mine to the consumer at a profit of five or ten cents per ton. One-half cent a bushel is a fair profit on grain. Such is the sworn and undisputed testimony.

Let the meaning of this as applied to the freight rate be

clearly apprehended. It means that if the grain dealer can by any device secure an advantage over his competitor of one-half cent a bushel, he thereby acquires the market as against that competitor. If one miller can deliver his flour at two cents per hundred pounds cheaper than the competing miller, he grinds at a profit while his competitor does business for nothing. A concession of ten cents per ton in the freight rate on coal determines absolutely who shall and who shall not handle the product of a particular mine or a particular locality. The same is true of other commodities.

A monopoly is by its derivation and in its simplest definition the giving to one in the sale of an article an advantage which all do not possess. Let it be observed that in the production and handling of the staple commodities about the only point at which such advantage can be obtained is in the agencies of transportation. Grain is an article of prime necessity. Everybody can raise it; everybody can buy it; everybody can grind it; everybody can sell it; but it must be transported from the railway station of the producer to that of the consumer, often by one route, at most by few routes, and the expense of this transportation is usually a considerable part of its price to the consumer. So with most of the prime necessities of life. Ordinarily the means and methods of competition must be open to all alike; the avenues of transportation are the exception.

Consider next how preferences are or may be granted in transportation. The obvious and simple way is by the giving of a special rate or by the payment of a rebate. Previous to the enactment of the act to regulate commerce this was the usual method. That act made the giving of a lower rate to one shipper than was accorded others a crime. Both the carrier who grants the special rate and the shipper who receives it are liable to fine and sometimes imprisonment. This necessarily worked a change in the method of granting such preferences. First, the tendency is to seek some less obvious method than the payment of a rebate under that

name or the giving of the special rate as such. In this view many devices have been adopted. These sometimes take the form of an elevator commission; sometimes an excessive car mileage; sometimes the shipper pays the full interstate rate in consideration that he shall receive preferential rates within the state to which the Interstate Commerce Act does not apply.

Second, the effect is to reduce the number of persons with whom these transactions are had to a minimum. The fewer people who are engaged in the commission of these crimes the less the risk of detection. The traffic manager prefers to deal with one rather than many.

The central idea of the trust is the combination of large amounts of capital in enormous transactions. It has money with which to build elevators and cars. It has traffic in all directions and under all conditions. It lacks apparently the sense of right and wrong which might actuate its agents if they were acting as individuals. Many trusts go further. They demand concessions which the carrier dare not refuse for fear of the punishment which may be inflicted by the withdrawal of traffic. Not long ago a prominent railroad president wrote to a friend who was a small packer: "I hope the time will come when I can give you the same rate as your great competitor, but to-day I cannot."

Now, putting these four facts together, the great effect of the small concession, the narrow margin on which business is handled, the opportunity and inducement of the railway to prefer one shipper to another, and the manner in which that preference must be exercised, what should we naturally expect?

Should we not expect that the great shipper, and that to-day is usually the trust, would enjoy these preferences at the expense of the small shipper, and that this preference, while small, a single cent as applied to a bushel of corn, two or three times that upon a hundred pounds of merchandise, would give the market to the one receiving it? These small

sums often represent more than the entire margin upon which the business is transacted, and are in the aggregate millions of dollars annually. The unavoidable result must be to exclude the small competitor from these operations and to centre business in the hands of the large competitor.

And what is the fact? It is well known that for years past a large portion of the competitive railway traffic of this country, especially those articles which are moved in large quantities and in the handling of which a small amount in the freight rate is of great consequence, have not been moved upon the published rate. It is an equally well-known fact that during the same time the tendency has been to centre the handling of these articles in the hands of comparatively few persons. The United States exports annually enormous quantities of grain, but you can count upon your fingers the concerns which bring the bulk of it to the American seaboard. We are told that grain upon the Chicago market is handled by a half dozen concerns. It is brought from the fields west of Chicago into that city by as few. One company buys upon one line of railway and nobody else can buy there. Another upon another line. Exactly the same thing is true of beef, pork, lard, provisions and almost all those commodities which are the necessities of life.

Is there any connection between these facts? Is the discrimination in the freight rate responsible for the concentration of business in the hands of the few? There cannot be the slightest doubt of it. No person at all familiar with the situation has any other opinion. Freight rate discriminations are the most potent factor in the establishment and continuance of great combinations of capital at the present time. It may be doubted if a single one of those monopolies which have fastened themselves upon the country in recent years could have done so in the face of absolute equality in the freight rate. I do not now speak of this epidemic of combination which has swept over the business world in the last eighteen months, but of those so-called

trusts in the essentials of life. Strip these great combinations of all participation in and all dominion over the freight rate and you take away from them the most important advantage which they possess.

But how about the Standard Oil Company? The representatives of that combine stated under oath before the Industrial Commission that since the enactment of the interstate commerce law of 1887 it had received no rebates and accepted no special rates. Here then is this typical trust, this, to the popular apprehension, arch-monopoly which flourishes although it pays the open rate.

The representatives of the Standard Oil Company stated that before 1887 it received rebates in common with other shippers. The good fortune of that company in those days was that its concessions far outran those of its rivals. It is generally understood that the genesis of that institution was railway favoritism. Its competitors assert that it derives just as real assistance from the manipulation of freight rates to-day as it ever has.

Departure from the published tariff is not by any means the only method of railway preference. The most grievous discriminations are often occasioned through the maladjustment of the rates themselves. It is in this manner that the Standard Oil Company is said to obtain its advantage to-day.

For the purpose of illustration, take what is called New Haven territory; that is, the territory controlled by the New York, New Haven and Hartford Railroad Company, embracing the southern part of New England. This territory upon most commodities takes substantially the Boston rate. A comparison of these rates in 1887 with present rates reveals a peculiar fact.

In 1887 the rate from Cleveland to Boston on grain and the products of grain was twenty-two cents, on iron articles twenty-two cents, and on petroleum twenty-two cents. The rate in October, 1899, was upon grain fifteen cents, upon

iron articles twenty cents, and upon petroleum and its products twenty-four cents. While the freight rate generally has declined, while the rate on probably every other article of general consumption has declined, while the actual cost of transportation has declined, we find that the rate upon petroleum has advanced.

There is another peculiar fact. On most commodities which are shipped from the West into New Haven territory there exists a through rate. In the case of petroleum and its products there is no such arrangement. Around New Haven territory is found a Chinese wall beyond which no carload of petroleum can penetrate unless it pays the local rate over the New Haven road to its destination. Grain, iron, coal—almost everything may be shipped from Cleveland into this territory under a joint tariff which in amount is substantially the same as the Boston rate, while kerosene must pay the Boston rate to the confines of that territory and an added local rate beyond. Thus the rate on a carload of corn from Cleveland to Boston was in October fifteen cents per hundred pounds and to New Haven the same. The rate on petroleum from Cleveland to Boston was twenty-four cents and to New Haven thirty-six cents.

The significance of these two facts becomes apparent when we consider how the petroleum business is handled in this territory. The Standard Oil Company has extensive storing facilities at East Boston and refines at seaboard points, or transports at low cost the refined product to such points from whence it is taken in tank boats to East Boston and thence distributed. Independent refiners at Cleveland assert that under present freight rates they cannot compete with the Standard Oil Company in this territory; if they had the former rate of twenty-two cents they might, if even the present Boston rate were applied as a through rate into that territory they might, but under existing adjustments they are absolutely excluded.

Still another circumstance contributes to the same end.

According to the tariffs of the New Haven Company petroleum and its products are second class unless the party to whom it is consigned has a private siding or a tank opposite the rails into which he can pump that petroleum from the tank cars, in which case it is fifth class. Now, the Standard Oil Company has these tanks and private sidings over all this territory, while comparatively few are owned by independent refiners. Persons without these facilities must pay the second-class rate, while the Standard Oil Company pays the fifth-class rate. The fifth-class rate between Boston and New Haven is ten cents per hundred pounds; the second-class rate twenty cents per hundred pounds, the difference between the two probably representing several times the profit in handling one hundred pounds of kerosene oil.

This is an illustration of one method by which the adjustment of the freight rate helps the Standard Oil Company against its competitors. For another and different way, take the comparative rates on petroleum and its products from Cleveland and Chicago to New Orleans and corresponding territory. The distance is somewhat greater from Cleveland. Both these cities are competitors in the markets of that territory. The demands of their merchants and of the railways serving the two localities have established a general relation in rates by which a difference of about two cents per hundred pounds in low class freight is made in favor of Chicago. Taking twenty-five articles of the most common consumption which bear about the same rate with petroleum, we find that in almost every instance the Cleveland rate is two cents per hundred pounds higher than the Chicago rate. Linseed oil, for instance, takes a rate of twenty-eight cents from Cleveland and twenty-six cents from Chicago. When, however, you reach petroleum, you find that while the rate from Cleveland to New Orleans is thirty-one cents, the rate from Chicago is twenty-three cents, a difference four times as great as that in case of almost every other commodity taking a corresponding rate. Now, there are large inde-

pendent refiners at Cleveland. The Standard Oil Company has extensive refining works at Whiting, near Chicago, which takes the Chicago rate, and there are no independent refiners in that vicinity. The Cleveland refiners say that this is an unjust discrimination against petroleum when refined at Cleveland, the purpose and effect of which is to deliver that southern territory over to the Standard Oil monopoly.

Attention is not called to these facts for the purpose of stirring up sentiment against trusts in general or the Standard Oil Company in particular. With much of this sort which is said, I have no sympathy. The Standard Oil Company, so far as I have observed in the department with which I have to do, is no worse than other trusts, nor so bad as many. These discriminations, if they are discriminations, to which I have called particular attention, are purely business propositions. The New Haven road puts in these tariffs because more revenue is yielded by them. Doubtless the Cleveland lines are compensated in some other way for the loss of traffic from there. The rates, such as they are, are open.

What I desire is to emphasize the fact that such discriminations do exist; to fasten attention upon the importance which they play in the upbuilding and maintaining of those great aggregations of capital which are thought to threaten the welfare of the body politic; to reiterate that they absolutely shut out the small shipper. Before we adopt some of the radical measures which have been suggested in dealing with the trust, before we amend the Constitution of the United States or enact laws which may impinge upon the rights of property or trammel our commercial development, this phase of the question should be looked to.

Just what ought to be done with the monopoly may be a grave question, but that our railways, those arteries through which the commercial life blood of this great nation flows, should be open to great and small alike, admits of no

doubt, and that they are not so open, admits of as little doubt.

It may be asked why the Interstate Commerce Commission does not prohibit these rate inequalities, thereby securing equal treatment for all shippers. The answer is that it is powerless to do so for reasons which have been often stated. The cardinal purpose of the Act to regulate commerce is to secure equal treatment for great and small, but without the necessary amendments the beneficent provisions of that Act are a nullity.

CHARLES A. PROUTY.

Washington, D. C.

RAILROAD AND CANAL STATISTICS.

CAPACITY OF RAILROADS FOR BUSINESS.

THE Reading Railroad, which is ninety-two miles in length, transported, in the year 1845, 800,000 tons of coal; and in the single month of July last, 104,000 tons. The business for the year 1846, is estimated at 1,220,000 tons, which is equivalent to 7,500,000 bales of cotton, more than three times the entire crop of the United States. If a like amount of up-freight is performed—and which might have been done, as the cars returned empty—we have an example of a railroad nearly 100 miles in length, capable of doing a transportation within the year, equivalent in weight to six times the cotton crop of the United States, or 12,000,000 of bales, and which would be equal to 5,000 ships of 500 tons each, performing two voyages to Europe.

This business on the Reading road, was performed at the rate of one cent per ton per mile, or \$1 for 100 miles—one-half of which is shown to be profit. At the same freight, a bale of cotton may be brought from the Tennessee valley, North Alabama, at fifty cents a bale. "Who can, with this exhibit," says the Charleston (S. C.) Mercury, "doubt the capacity of railways competing successfully with river navigation, or the ability to transport, at remunerating prices, western produce to our south Atlantic markets? Enterprise and confidence is all that is necessary; and if our southern cities, with all the lights before them, are resolved to remain in slumbering inactivity, others, acting up to the spirit of the age, will enjoy the harvest."

READING RAILROAD.

The following are the receipts of each of the twelve months of the year 1845, as compared with the twelve months of the preceding year:—

	1845.	1844.		1845-6.	1844-5.
June,.....	\$101,493	\$49,066	December,.....	\$65,172	\$43,066
July,.....	129,502	63,042	January,.....	69,754	40,675
August,.....	127,513	76,997	February,.....	65,026	32,495
September,.....	132,612	72,175	March,.....	96,720	47,655
October,.....	131,879	76,476	April,.....	155,183	68,176
November,.....	125,946	62,197	May,.....	144,035	79,882

ERIE CANAL AND WESTERN RAILROAD.

The great State work of Massachusetts, has frequently been compared to that of New York State, as a means of developing the resources and improving the property of the Commonwealth. The analogy of the receipts in the two cases, for the first five years, is rather impressive:—

Erie Canal.	Erie Canal.	Western Railroad.
1825..... \$566,000	1842..... \$1,743,000	1842..... \$512,688
1826..... 793,000	1843..... 2,087,000	1843..... 573,881
1827..... 860,500	1844..... 2,432,000	1844..... 753,752
1828..... 833,000	1845..... 2,620,000	1845..... 913,478
1829..... 818,000		1846..... *976,000

* The increase on the Western road, thus far, in 1846, is over 20 per cent, giving \$70,000 for the first six months, and being at the rate of \$163,000 for the year, making the total, as above, \$976,000. The expenses to the present time have not increased.

—*Boston Courier.*

COMPARATIVE COST OF RAILROADS.

Twenty years ago, a short road at Quincy, to carry marble, was all the pioneer we had. Now we have nearly 4,000 miles of railroad in actual daily operation in the United States; and a great deal more in the rest of the world. The materials of experience are therefore sufficiently abundant. The cost of seventy-nine railroads in the United States is given in a table published in the *American Railroad Journal*. The aggregate length of them is 3,723 miles, and the cost is \$109,841,460; or \$29,325 85 per mile.

In the Carolinas and Georgia, 785 $\frac{1}{4}$ miles cost but \$14,063,175, or \$17,919 per mile; those of North Carolina and Georgia, 583 $\frac{1}{4}$ miles long, cost \$8,391,723, or \$14,387 72 per mile; those of Georgia, 337 $\frac{3}{4}$ miles, cost \$5,231,723, or \$15,489 per mile; the Central Railroad in Georgia, 190 $\frac{1}{4}$ miles long, cost \$2,551,723, or \$13,570 72 per mile; and that part of the Georgia Railroad, of 65 miles, which has been constructed of late years, is said to have cost less than \$12,000 per mile, including an edge rail; or, as commonly called, a T rail.

The residue of the railroads on the list, in the Northern and Eastern States, amounting to 2,937 $\frac{3}{4}$ miles in length, cost \$95,788,295, or \$32,633 23 per mile.

TRANSPORTATION OF MILK ON THE ERIE RAILROAD.

The following statement of the revenues ensuing from the transportation of the single article of milk, for the four years ending Dec. 31, 1845, is derived from the books of the New York and Erie Railroad Company:—

1842.	1843.	1844.	1845.
\$3,430 72	\$18,497 46	\$28,055 08	\$30,694 20

STATISTICS OF POPULATION.

IMMIGRATION INTO THE UNITED STATES.

THE following statement of the number of immigrants who have arrived at the port of New York during the six months commencing on the 1st of January, 1846, and ending on the 30th of June, is derived from the books of the United States Revenue Barge Office, under the charge of Captain Thorn:

January.	February.	March.	April.	May.	June.
1,138	661	4,000	7,043	18,954	18,834

Showing a total of 50,631 for the six months ending June 30th, 1846. The number of immigrants, according to the same authority, for the six corresponding months of 1845, was 37,809; being an increase in favor of the first six months of 1846, of 12,820.

A letter in the *Washington Union*, from Hanover, Germany, May 23d, 1846, estimates the number of emigrants to the United States, from Europe, during the present year, at not less than 200,000. Many families in affluent circumstances, the writer says, are quitting Holland for our shores. Twenty thousand persons, chiefly French or Swiss, also will embark at Havre. Forty thousand Germans, at the lowest computation, will sail from Bremen, three or four thousand from Hamburg, as many more from Rotterdam, and four or five thousand from Antwerp. These, with thirty thousand from Ireland, the writer believes, will carry with them a capital exceeding \$20,000,000.

It is, therefore, perfectly apparent that no one of these qualities can be in such wise described as to be of any other utility than what may serve to make one acquainted with the conditions on which they depend, and to show the importance of *the whole taken together*, in applying them to a particular variety of wine.

The proportion of water, alcohol, and extract, contained in wine may be determined by evaporating a known quantity of wine into a receiver. The water and alcohol being thus collected together may be separated by distilling, and their relative proportions, and also the weight of the fixed principles or crude extract left upon evaporation, known. Take, for example, 100 drams of wine, evaporate to dryness, the weight of the residue is found to be 20 drams, showing the amount of water and alcohol to be 80. Now distil off the alcohol, and there remains say 72 drams of water. The result of this operation would be in the 100 parts, of water, 72; extract, 20; alcohol, 8.

It is in this manner that the relative proportion of these main constituents in wine may be ascertained. If, therefore, a type of wine is found to give the above proportions, and a suspected example purporting to be of the same character, is found to leave but 18 per cent of extract, and if on distillation only 7 per cent of alcohol is obtained, proof is pretty clear that the wine in question has been diluted with water.

The quantity of extract found by Mr. Filhol in the chief wines of the department of Haute Garonne, in France, is found to vary from 19 to 25 per cent, or a mean of 22 per cent.*

ART. V.—RAILROADS AND THEIR FUTURE.

FREEMAN HUNT, *Editor of the Merchants' Magazine and Commercial Review*:—

SIR:—Now that the "crisis" is past, and the clouds which lowered so gloomily over the commercial horizon for a few months are breaking away, it is to be hoped that the lessons taught by the overwhelming panic of 1857 may not be altogether lost upon the country. As was natural, when the first shock of the disaster had somewhat abated, men looked around them, and began to inquire, one of another, for the causes which had led to so sudden and unexpected a revulsion. As if by common consent, it was voted that the *railways* were the authors of all the mischief, and the bears of the Exchange, who had so tenderly nourished this idea in the public mind, themselves became terrified as stocks and bonds went tumbling down like a mighty avalanche, and threatened to engulf them in an unfathomable abyss. The veil which had for so long concealed the blundering incapacity of presidents and directors of some leading and favorite lines was rudely torn away by the fury of the hurricane, and stockholders stood aghast at the spectacle revealed before them. The alarming inquiry followed, "*Is the American railway system after all a failure, as an investment for capital?*" A pregnant question truly, when we remember that more than five hundred millions of dollars are at stake upon the answer!

That a considerable proportion of the vast sums expended in the building of railways in the United States during the last twenty years has been

* ERRATUM.—On page 49 of last number, in last line, for "Madeira" read "Malvasia."

furnished rather with a view to collateral advantages than to any profits upon the stock is well known; and it is equally true that the contributors have in many cases being more than reimbursed by the enhanced values of their property, consequent upon the construction of railways near them. But it is doubtful whether these motives alone would have been sufficient to secure the completion of any of the long lines of railway now traversing the country in every direction, without the aid of another large class of contributors, who were induced to embark in these enterprises under the belief that they would be profitable investments for capital. In the earlier stages of railway experience this belief was fortified by the success of some of the principal lines then in operation, and so railway building has been going on for twenty-five years until a thousand millions of dollars have been expended upon them in the United States, about one-half of which is represented by bonds and debts, and the remainder by the capital stock. These bonds are mostly held abroad, and the stock at home. To the holders of the latter belong the exclusive control of the government of the various companies, while the former stand as preferred creditors, and are the first recipients of the profits derived from railway operations, to the extent of their annual percentage of interest. So long, therefore, as the managers of any railway corporation are able to provide for this interest, the bondholder has no right, and but little inducement if the right existed, to inquire into the internal administration of its affairs.

Such is the activity of inland commerce that, even under the most incompetent management, the majority of our railways earn and pay the interest upon their bonded debts with a fair degree of punctuality; consequently the market values of this class of railway securities generally approximate towards par, while a few favorites sometimes command a premium. With the "stock" the case is far different; after discharging the preferred liability there is often nothing left for dividends, and the investment at once becomes a "fancy." Some roads, after years of seeming prosperity, with receipts counting by millions, are now reduced to this condition, while it is discovered that the "construction account" has been the open door through which directors have invited stockholders to walk in to receive dividends that had never been honestly earned. Other lines have managed to create large floating debts, which have become too heavy to float any longer, and bid fair to sink the stock altogether out of sight. This is the present status of the leading roads that have been under "Wall-street management" for any considerable period. Their cost has been swollen in some cases to more than double the original amount when completed; enormous sums have been worse than wasted in negotiations; and in short, they have been "financiered" to death, and their stock will hereafter be quoted nowhere, unless perhaps on the books of the coroner.

This brings us back to the question before propounded—are these lines only bowing to the decree of manifest (railway) destiny, and descending to the inevitable bourne from which no dividend returns? Is the same fate to overtake, sooner or later, all the rest, until five hundred millions of stock shall be extinguished forever? The answer to these questions, in our judgment, depends upon stockholders themselves.

We are aware that the clamor against railway stocks is universal, and that it is the fashion to decry them without discrimination. Notwithstanding, and presumptuous as the opinion may seem, we do not hesitate

to express our belief that—with all the reckless folly of managers, and the shipwreck they have made of stockholders' interests—three-fourths of the lines in the United States, well located for traffic, may yet be rescued from the annihilation which seems impending over them, and be made to yield as permanent and substantial dividends as the like capital invested in banks, manufactures, or other favorite enterprises.

In American railway management the administration is confided to a Board of Directors, which is generally composed of men chosen for their personal wealth, influence, or respectable standing in society. These gentlemen, being usually engaged in active private pursuits, and receiving no compensation for their services as Directors, could not of course be expected to devote much time to the affairs of the stockholders. They however select from among themselves a President, upon whom is devolved the active executive management of the concern. This officer is supposed to devote his entire time and talents to the service of the company, and receives accordingly a suitable compensation. Unfortunately the salary attached to this office is tempting enough to make it attractive to some one of the many very respectable old fogies who turn up in every community whenever a comfortable pension is in prospect; and in nine cases out of ten, through a little electioneering management, the post is secured to some excellent individual without the remotest reference to his personal fitness for the important and responsible duties assigned him. Extraordinary as the fact may be, it is a matter of every day occurrence in railway history, that, in the choice of Directors and Presidents, stockholders ignore all the rules that govern human action in other departments of life, and readily place their vast interests in the charge of men utterly devoid of the first elements of railway knowledge, and unqualified by age, previous education, and pursuits, to attain to them. As a natural consequence, on such a road, the President is dependent upon, and really controlled by, a corps of subordinate officers and agents, who, having no direct responsibility to the stockholders, feel neither pride nor interest in the skillful management of its affairs.

When stockholders look beyond the ranks of honorable judges, retired politicians, or, worse than either, celebrated financiers, and select young, practical, energetic, talented men of business, who have reputations to create and an honorable ambition to stimulate them, a long step will be taken in the right direction. Indeed, it is not perhaps too much to say that the responsibility for the failure of many railroad enterprises to reward "the promise of their dawn," is justly chargeable to Boards of Directors, who have confided (either from ignorance or improper motives) the chief executive administration to men totally incompetent for the peculiar duties of the station. Scores of men can be found to-day, scattered in various positions over the roads of the country, who have the ability and knowledge which, placed in the executive chair, would soon gladden the hearts of stockholders with far different results than those generally chronicled in the journals of the day.

We enlarge upon this point, for we believe that herein lies the key to a great practical reform in railway management. The Presidency of a railroad company is not a cushioned easy chair for indolence to loll in for the enjoyment of a comfortable nap, but is, or should be, emphatically the post of action. With sound judgment, quick perception, and fair administrative talent, the executive of a railway should combine mercantile

method, and attention to detail, with active business habits, and should exercise a sleepless vigilance over the whole operations of the company, in all their varied relations.

In running our eyes over the long list of railways in America, and noting the few lines here and there which have proven a success, we shall find—not that it is due to the fortunate routes they occupy, nor that they enjoy a larger traffic, or have any specially favorable local influences to explain their advantages—but that they have men at the helm who comprehend the duties of their position, and are adapted to all its requirements.

Let stockholders, then, discard partisan feeling from their annual elections, and select the right men for the right places. Let them order the “construction account” to be closed, if it be a complete road, at once and forever; or, if unfinished, when the last rail is laid and it is fully equipped for service. Let them prohibit floating debts, and establish a renewal fund to cover annual depreciation of every kind, and let Presidents and Directors reflect that dividends depend not upon financiering operations, but upon the earnings of their locomotives and cars, and economy of expenses in the details of management.

When stockholders shall determine to enforce these considerations, railway stocks will no longer languish under the frowns of public disfavor, but will rank side by side with other substantial and profitable investments of capital, and railways in America will be no longer a doubtful problem.

Art. VI.—THE RAILROADS AND CANALS OF NEW YORK.

IMPORTANCE OF THE NEW YORK AND ERIE AND THE NEW YORK CENTRAL RAILROADS TO THE COMMERCE OF THE STATE OF NEW YORK, AS INDUSTRIAL MACHINES, FOR THE TRANSPORTATION OF FREIGHT AND PASSENGERS, AS COMPARED BY THE ANNUAL GROSS RECEIPTS OF THESE ROADS, WITH THE TOLLS AND RECEIPTS ON THE ERIE AND LATERAL CANALS.

TO FREEMAN HUNT, *Editor of the Merchants' Magazine* :—

DEAR SIR :—A distinguished and intelligent merchant, of “Major Downing memory,” presiding at a meeting of the stock and bond holders of the New York and Erie Railroad, last fall in New York, took the view—and by no means an extravagant one, in calling on the citizens of New York to support this work—“that this road was as important to the prosperity and commerce of the city of New York, to reach the grain and provision regions of the West, as was the passage to the ocean by the Narrows. That it was of more advantage to her, than the Erie Canal, as it was open the entire year.”

To give a view of the importance to the commerce and industry of our State by our canals, as compared with the Erie and Central Railroads—(the latter ignored by Mr. C. A. Davis, by some obliquity of vision, like many of his associates, with their eyes only fixed on the New York and Erie Railroad,) a few facts and figures, principally from the last report of the Central Railroad, will suffice to show that for certainty and celerity, and this too at all seasons of the year, the railways in this State, as well as beyond us in Ohio, Indiana, Illinois, and I may add elsewhere, are

gradually and surely trenching on, and curtailing the tolls and receipts from canals. They are, in fact, destined finally to supersede them, with the exception, perhaps, of the Erie and Oswego Canals, connecting, as they do, inland seas with the ocean. There is a hope, however, for these State works, that the increase of tonnage, transported through the State of New York, is destined in all probability to increase faster than our avenues and facilities to transmit tonnage and passengers to and from the great commercial center of this continent, if not of the world, situated, as it is, nearly midway between Europe and Asia, at the outlet of the only depression of the Alleghany ridge—at the Little Falls and the Highlands, connected as New York is, with a continuous line of railways, that have progressed, during the last fifteen years, link by link, until they have bridged the Mississippi, reached the city of Iowa, and are in the course of construction to Council Bluffs, on the Missouri, thence up the valley of that river to the portage, between the sources of this stream and the Columbia River, where we have the lowest depression of the Rocky Mountains; while down the valley of this water course, to its mouth, and the admirable ports on the Straits of Fuca, is a line that will still settle itself from the admirable grain and grass lands on the whole route. These facts leave little doubt in the minds of those who have investigated the subject, and have read Edwin F. Johnson's (chief engineer,) and Gov. Stevens' reports, that this route, and at no very distant day—even if unaided by the General Government—is destined to be the main avenue and connection with Eastern Asia and the possessions of Russia, through Prussia to the Atlantic.

This is no fancy sketch. It is sure to be realized. Then, as the *New York Evening Post* has predicted, "the commercial center of the world will pass from London to New York."

"The Grand Canal," was a great work when first projected, and started the rapid growth of the city of New York. This would have been accelerated 50 years had the recommendation of Col. John Stevens, of Hoboken, to Canal Commissioners Livingston, Morris, and Clinton, in "documents tending to prove the superior advantages of railways over canal navigation, printed by T. & J. Swords, 1812," been adopted. At that early period, among other reasons, he took the sound position, viz. :—

"Fourth. These railways, from the nature of their construction, will be free from numerous casualties to which canals are liable.

Fifth. The expense of transportation would be much less than on a canal of the best construction.

To prove this, a summary calculation will be necessary."

He then demonstrates his 5th position as clear as the 47th problem of Euclid; he describes the locomotor, and the principle of *adhesion*, for which Stevenson got \$2,500 from the Liverpool and Manchester Railroad Company, for inventing!! (in 1829,) that which Stevens described in 1811.

Had Mr. Stevens been listened to, as a sane man, by the great men named, and their puerile objections against railways been examined into, (stated in the "documents,") the State and city of New York would have been half a century in advance of her present position, in population and commerce, as I contend—railways now make cities, not water courses. In evidence of this view, look to the merchants of New Orleans, calling for a railway up the Mississippi to St. Louis. Of late, trade and travel

have been drawn up and from the Mississippi, mainly to our Erie and Central Railroad, for certainty and celerity, at all seasons.

Chicago is the greatest receiving and distributing city in the world for grain, arising from her numerous railroads, penetrating the rich prairies of the West in every direction. It is the railroads, radiating from Boston and from New York, that is pushing them ahead of all other sea-board cities. Philadelphia, in a measure, is tributary to New York, even with the partial facilities, furnished by the Camden and Amboy Railroad in its present equipment to carry freight. This arises from this company being obliged, by family influence, to take the burden of the Delaware and Raritan Canal on them, when this canal, 7 feet by 70, did not pay one per cent on its cost, \$3,000,000. It now divides 8 per cent per annum, paid from the earnings of the railway, who drive the bulky articles and coal to the canal, by asking exorbitant prices. The railway has not equipped itself properly for freight, otherwise this company could have swept the entire coasting trade from Philadelphia to New York, as well as the tonnage now transported on the canal.

After the completion of the Erie Canal, (1825,) but with an error, or more probable cheat, of nine inches in the level and bench marks between the Mohawk feeder at Rome and Oriskany, which finally filled up to less than three feet water in the canal, and was the main cause for the enlargement, and also to cut off the project of the Hudson by a steamboat canal, on the north side of the Mohawk, by Oneida Lake and river to Oswego—was the introduction of the packet, and semi-packets, that carried 15 to 20 tons, and any quantity of extra baggage at very low rates. "This luxurious mode of traveling," as it was called, while sleeping on shelves three deep, superseded the admirable line of post coaches then traveling daily between Albany and Buffalo. We find by a report of the Canal Auditor to the last Legislature, Senate Doc. No. 10, "the tolls on these passages added largely to the revenues of the State. In 1836, they were nearly \$100,000; in 1840, \$36,815; in 1855, \$1,228, and in 1856, they touch zero, (0) in their competition with the railways parallel to them."

The emigrant and the poor man, whose time was his only capital, to-wit. the saving of eight days in time, and for food, was more than sufficient, as experience has proved, for the poor man to take the railway—the better industrial machine—even if a passage was given to him by the canal.

As the several links of railways in the line from Albany to Buffalo, through our populous villages and cities were completed, (without reference to its location for a freight railroad,) the inland storekeeper was seen in the spring and fall, and soon, oftener, with a large shoe trunk, to carry the baggage that he now puts into a carpet bag, visiting the city of New York "to fill up." On his return he was sure to have two or more large trunks as "extra baggage"—or, all the trunks but one, palmed off on his country cousins, as their baggage, thus to avoid the State tolls. This was stopped by the agents of the Canal Board. The public in the interior flooded the Legislature, it may be recollected, with petitions to compel the central line of railways to carry "extra baggage as a great convenience and advantage to commerce." They were answered—as appears by the statute book—"you may carry and incur the responsibility of extra baggage, provided you do not charge for it."

Again, petitions came to the Legislature, asking "to permit railways to carry freight, generally, paying canal tolls." They were answered after much delay; yes, you can carry freight during the months the canal is closed, (and in fact after the State had got the tolls on all that was worth carrying,) provided you pay us full canal tolls. This, it was evident, would not answer or pay the railroads to equip their roads with motive power, rolling-stock, and warehouses, more expensive, to a great degree, than the rolling-stock required to convey passengers, who loaded and unloaded the passenger cars. In addition to this, there were six separate incorporations, who could not act as a unit, or with safety incur the responsibility of transporting freight, with a decided responsibility.

Again, petitions were pressed on the Legislature, "that the central line of railways be permitted to carry freight the whole year, paying full canal tolls, as they were a great convenience in carrying provisions and perishable articles that could not go by the slow canal." The State Engineers, by their reports, certified to the public (a disgrace to their intelligence, if not to their integrity, as guardians of the supposed interests of the State—under the policy we were then pursuing to make railways subservient to the enlargement of the canals,) in substance, "that the State had nothing to fear in a competition with railways—they would carry a few valuable, light, and perishable articles, but that they were not adapted to carry flour and general tonnage." Our State Engineer, Mr. McAlpine, went so far as to say in nearly so many words, "that it would take six double track railways by the side of the Erie Canal to do its business." *Pro pudor.*

I now come to the point for which I mainly took the pen—"to show the importance of the New York and Erie and Central Railroads, as industrial machines for transportation of freight and passengers, by their receipts, as compared with the annual receipts by our canals."

The Erie Canal, with its laterals, is 899 miles in length. The New York and Erie Railroad is 464 miles from Lake Erie to Jersey City, and the Central, 300 miles from Buffalo to Albany. These two works, with their rolling-stock and warehouses, have cost seventy-five millions of dollars. The canals, when enlarged as now progressing, with boats, horses, and warehouses, will exceed this sum, and probably not fall short of one hundred millions.

Let us see, by their receipts, how these railroads compare with our State canals, as yielding facilities to the traveling and trading public. The railways are only in their A B C's, in learning their lessons in transporting freight. The Central Road, and I may add the Erie, have done wonders in their management in carrying freight, in their present state and equipment, carrying, as they have done the last year, upwards of four millions of passengers, and 1,600,000 tons of every variety of articles, over grades that may be much improved, particularly those of the Central Railroad.

It appears, the central line was released by the Legislature of 1851, from canal tolls, to commence January, 1852. They then commenced to contract to build freight-engines and cars. The act for consolidating the several railroad incorporations from Albany to Buffalo, to make them a unit, under one board of directors, and without which they could not well have incurred the responsibility of freighting, did not take effect until the year 1853, so that from this period of four years it is only necessary to show the rapid increase of receipts on this line, and the falling off of

our receipts or our canals, since 1847, when they were at their highest, to present a view of the estimation which the producer and consumer—and I may add the banks, in yielding facilities to get produce to market—considered each class of improvement. It is a plain, simple test.

In 1847, the receipts by the State, in tolls and water rents, from all canals was, \$3,634,850; in 1856, they had gradually fallen to \$2,742,356; in 1857, they had gradually fallen to \$2,014,548; showing a falling off in one year, of \$727,808; and in ten years, of \$1,602,302.

“In 1853, there were 637,748 tons of freight, the produce of this State, delivered at tide-water by the Erie Canal, and in 1855, there was only 327,839 tons of the like produce arriving the same way. Decrease in ten years, 309,909 tons.” These official statements (Senate Doc.,) speak for themselves.

It is estimated that the average of the canal forwarder for freight, is not generally equal to the State charge for tolls. We will, however, call it so, and double the receipts of the last year—\$2,014,458 to 15th December, (instead of the fiscal year 30th September,) and we have \$4,029,096 as the receipts for freights on 4,000 canal boats, and the gross earning of say 10,000 horses and full 20,000 hands on the boats to earn, in round numbers, four millions of dollars.

By the late Annual Report of the New York Central Railroad Company, to the State Engineer, under oath, we find this important work to the industrial interests of this State received for carrying 2,609,947 passengers to the end of their fiscal year—30th September, 1857—\$3,147,638.

The receipts for carrying 545,914 tons way, and 292,877 tons through, of freight, with mails and express, was \$4,879,614; total receipts for 1857, \$8,027,252.

I have not before me the report of the New York and Erie Railroad for 1857. In 1855, this company transported 842,054 tons of freight, and about 1,500,000 passengers. The gross receipts between \$6 and \$7,000,000. This year, the receipts, I learn, are near seven millions. This sum, in round numbers, added to eight millions received by the Central Railroad Company, as the industrial product of these two roads, is as 15 to 4, as compared with the receipts by the State and forwarders on all our canals, and of course we may say, that these two roads are nearly four times as important to the growth and prosperity of the city of New York as all our canals. There should be taken into the calculation, the Oswego and Syracuse, the Cape Vincent and Rome, and Ogdensburg and Boston Railroads, leading from Lake Ontario, that transported on these valuable improvements to develop the industry and resources of secluded districts, 400,000 tons of produce and merchandise, and half a million of passengers, that it is now proposed to tax with canal tolls.

The following table from the Central Railroad Company's Report, for 1857, (page 13,) shows the rapid increase since this road began to equip herself, (1853,) to transact a general freighting business. It is at the rate of \$800,000 per annum.

This company now own 218 locomotive engines, 196 eight-wheel passenger cars, 2,845 freight cars, and 285 gravel cars, that have cost, by the report, \$5,172,077. If coupled together they would extend in line 20 miles. Three-fourths of this expenditure, with warehouses, etc., has been incurred on the faith of the State repealing tolls. The enabling act to consolidate the several railroad incorporations, and to get rid of those

who had commenced the Mohawk Valley Railroad, cost high rates of premium, as the several roads were dividing 8 to 10 per cent among their stockholders, in carrying passengers, with comparatively, not to exceed one-fifth the present rolling stock and motive power, now owned by the consolidated company. This should have its consideration, as no doubt it will, to prevent any re-imposition of canal tolls, as I perceive the canal interest at Rochester (certainly not the mill interest) have *resolved*, that they will petition to the next Legislature to place on railroads.

Let us take a view of the equipment of the canal to carry freight. It is estimated that there are 4,000 boats and scows, that are worth on an average \$800 each, or \$3,200,000. Say $2\frac{1}{2}$ horses to a boat, and give 10,000 horses, that have cost \$80, and a like sum to keep them a year would be \$1,600,000. With the average of five persons to each boat, we have 20,000 persons, who should earn \$140 per annum, or \$2,800,000. It will require three acres of land in grain and grass, for hay, to support a canal horse, or 30,000 acres of land. The 218 locomotives—the iron horse—require in fuel, prepared for use, 191,119 cords of wood, that cost \$847,853, for the year ending 30th September, 1857. Estimating, say 60 cords to the acre, this would clear up 3,200 acres to produce food sufficient for all the operatives on this road, and the estimated 20,000 on our canals.

STATEMENT OF EARNINGS FROM PASSENGERS, FREIGHT, AND OTHER SOURCES, FOR THE YEARS ENDING SEPTEMBER 30TH, 1853-4-5-6-7.

Years.	Passengers.	Freight.	Other sources.	Total.	Tonnage, way & through.
1853.....	\$2,826,668 74	\$1,835,572 25	\$122,279 18	\$4,787,520 17	360,000
1854.....	3,151,513 89	2,479,820 66	286,999 95	5,918,334 50	549,805
1855.....	3,242,229 19	3,189,602 90	131,749 05	6,563,581 14	670,073
1856.....	3,207,378 32	4,328,041 36	171,928 50	7,707,348 18	776,112
1857.....	3,147,636 86	4,559,275 88	320,338 67	8,027,251 41	838,791

It will be perceived the increase in freight receipts in four years is \$3,239,731, while the tonnage has more than doubled since 1853, and there has been a decrease in the receipts for passengers of \$3,877 in the last four years, or nearly stationary during the last four years. During this period the Central Railroad Company have regularly paid 8 per cent per annum to its stockholders, the interest to its bondholders, \$970,871 12, besides having a "debt certificate fund of \$632,000, and a balance of income account, 30th September, 1857, of \$1,826,572 39," and "without one dollar of floating debt." It is calculated the sinking fund will pay the debts of the company.

How does this picture compare with the receipts on the State works? It appears that our canals are running us in debt for their attendance and repairs, while we are obliged to resort to direct taxation to meet our indebtedness for the enlargement, and with no certainty of being remunerated for further expenditures for the enlargement, if we are to judge from our experience, and that of Ohio and Indiana, of the result of competition between these two classes of internal improvement. The following is taken from the New York *Tribune*, of the 17th December, under the head of money article:—

"The tolls collected on the Wabash and Erie Canal, Indiana, for the year ending the 1st inst. amount to over \$60,457 14. The tolls last year were \$113,643 14. They fall short largely of the expense of the ordinary repairs of the canal. The tolls for the year 1852 were \$187,392 15. The diminution from year to year since

is to be referred to the competition of the railroads. Similar results are experienced in Ohio, where their canal tolls have fallen off in the same ratio, owing to the same causes."

Mr. Benton, the Canal Auditor, in his report to the Senate, 9th of June, 1857, (Doc. No. 10,) after showing that out of 1,518,000 barrels of flour, shipped in 1856 from Buffalo and Black Rock, only 76,476, or one barrel in twenty, went by the canal. Mr. Henry Fitzhugh, Canal Commissioner, in his report to the Senate (Doc. 127, page 39,) corroborates Mr. Benton, by tables, facts, and figures. He says, "thus it appears that of the leading articles of flour, pork, beef, bacon, lard, tallow, and oil, arriving at Buffalo, but a small portion is shipped by canal.

We must not suppose that the above articles are the only portion of this trade that will be taken by railroads from Buffalo and elsewhere. There is no article of transportation better suited to movement by railroad than *grain*; none that, with proper arrangements, requires less manual labor, or can be more easily transferred by machinery from boats and vessels to cars, and from cars to vessels or storehouses, and that it will soon become as common an article of transportation on our railways as any other, admits not of a doubt." * * * *

"But we have not other competitors for this trade north and south, beyond the limits of control of State legislation, which are yearly acquiring increasing facilities for sharing in this trade." * * * *

Mr. Fitzhugh, a canal forwarder of more than twenty-five years, remarks, (page 49,) "as to what would be the effect of re-imposing tolls on the railroads, as well as by subjecting to toll all roads competing with the canals, I have no doubt that ample revenue may be derived from them, if it were deemed just and expedient to tax them with canal tolls."

* * * * He then shows that it would drive trade through Pennsylvania and the Canadas, and remarks, "It would be a tax local and invidious in its character, and would damage the commerce of the State in which we are all interested." * * * *

"The great object sought by our system of canals and railroads has been commerce, and the result has justified our anticipations and rewarded our efforts. Under this system our State has greatly prospered, and it is not deemed wise to hazard this prosperity by new and doubtful experiments, particularly now when neighboring States and provinces are preparing to wrest this travel and trade from our State."

Should not this view of the relative importance of these two classes of internal improvements—as industrial machines—with the fact that Great Britain during the last quarter of a century has invested nearly two thousand millions of dollars (half her national debt) in railways, while her capitalists have not invested one dollar in any new canals, with the like course for the last ten years of all the States of this Union, (with the exception of New York,) admonish the incoming Legislature to examine and inquire into the relative merits of railways and canals, with a view to a new disposition in our State policy?

In fine, it would appear by all late experience in this State, as well as in Pennsylvania, our State officers, elected by the popular vote, are not competent to manage our public works, without corrupting all those who have anything to do with the immense sums that are squandered, and will continue to be squandered, on our public works, and then, *cui bono*, except to make banking capital the true secret, if we could arrive at the

fact why the people have been called to issue their bonds for "the more speedy enlargement" during the last twenty years, to issue "credit money" on the twenty and odd millions lodged with the bank department to meet the same, which, in the late panic, fell about 30 per cent, in throwing about 10 per cent of our State promises into the market to redeem our "credit money," the true secret of the enlargement as now progressing.

In conclusion, has not the time arrived to use the earnings of our canals, if any, and the canal tax now collecting, to clear out our canals for the best navigation they will give us in their entire length, to Lakes Erie and Ontario? We may find it to our interest to follow the example of Pennsylvania, to sell our public works to private enterprise, and thus get rid of their political and corrupting influence.

Since writing the foregoing I learn that eleven freight trains, with 36 cars in a train, each loaded with eight tons, or 3,168 tons daily, or one million of tons per annum, in one direction, is now passing Syracuse with western produce, cattle, hogs, sheep, etc., to supply the seaboard markets. This daily tonnage is independent of trains of passenger cars, each way, carrying 2,609,974 per annum, or above 8,000 passengers daily.

Should not this freight and passenger travel have a railroad bridge at Albany, so as to form a continuous, unbroken line between the lakes over our State and the seaboard? Which is the major interest—for on this the question—that of two or three steamboats daily from Troy, with the sloop trade almost reduced to the carrying of lumber, and which will be taken from Troy by railway, so soon as the Harlem and Hudson companies equip themselves to carry this article to the upper wards in the city of New York, on better terms and where it is required for building; or the lines of railroads from Lakes Erie, Ontario, and Champlain?

J. E. B.

JOURNAL OF MERCANTILE LAW.

COLLISION ON THE NORTH RIVER.

Discision in Admiralty—United States Circuit Court. Before Judge Nelson. The following decision in Admiralty in appeal from the Court below, was rendered in September, 1857. *H. Fitzhugh, et al., vs. the steam propeller Commerce* :—

NELSON, C. J.—The libel in this case was filed by the owners of the barge *Isabella* against the *Commerce* for a collision on the North River, near Castleton, some ten miles below Albany. The steamboat *Indiana* was ascending the river on the east side with a tow of ten boats. The *Isabella*, the one in question, with barge *Cleveland*, were the last tier, and were connected by a hawser to the tug. There was an intermediate tier of four canal boats, also connected by a hawser, some two hundred feet in advance of the two last. The *Indiana* had passed Mull Island, and had straightened up on the east side of the river, as near as it was safe for her to go, and had advanced so far that the last tow was opposite or just above the head of the island. The *Commerce* had left Albany that evening, and was descending the river on the west side, the *Oregon* following her at a distance of a few hundred yards. The night was not very dark. The *Commerce*, after passing the *Indiana* west from seventy to one hundred feet, when about opposite the second tier of tows took a sheer to the east, and thus changing her course, struck the *Isabella*, which was lashed to the larboard

side of the *Cleveland*, and, of course, nearest the *Commerce*, sinking vessel and cargo. The Court below was of opinion, upon the proofs, that the *Isabella* was wholly in fault, being out of place at the time, and far in towards the west shore, and in the track of the *Commerce*, and dismissed the libel. The conflict and obscurity of the proofs on this point have been very much cleared up by the evidence of the pilot of the *Oregon*, who had charge of that vessel, which has been taken in this Court since the appeal. The evidence of the master of the *Indiana*, and of six of the tows, is very full and explicit, that, at the time of the sheer of the *Commerce*, the two last tows, the *Isabella* and *Cleveland*, were on a line, or nearly in a line, with the tug, which confessedly was as far to the east shore as was safe; and the master of the *Cleveland*, to which vessel the *Isabella* was lashed, states that his vessel was about as near the shore as was prudent for him to go. And further, they all agree that there was room enough for the *Commerce* to have passed west of the tow, and that the sheer was unnecessary, and the direct cause of the collision. These witnesses all saw the sheer, which, indeed, is admitted by the witnesses for the *Commerce*; and, apprehending a collision in consequence, watched the course of the vessel until it happened. They speak, therefore, with confidence as to the transaction; and, indeed, cannot well be mistaken; and they are fully confirmed by the testimony of the pilot of the *Oregon*, who also apprehended the collision when he saw the sheer, and kept his eye on the *Commerce*. The evidence of this pilot, who was first pilot of the *Oregon*, very much shakes the testimony of Wilson, the second pilot, who was examined on behalf of the respondents in the Court below.

The defense set up to justify the sheer is placed on two grounds:—1. That there was a light on the *Isabella*, and that the pilot of the *Commerce* supposed, and had a right to suppose, she was a vessel at anchor; and that, being well out in the channel of the river, he made the sheer to pass her on the east side; and 2. That she was so far out in the channel there was not room to pass her on the west side. As we have already said, the testimony of the captain of the tug, and of six of the tows, is very strong to show that the pilot was mistaken as to the room in the channel west of the *Isabella*. But in addition to this, is the evidence in this case of the pilot of the *Oregon*, who was looking on, and who passed over the tract just at or near the moment of the collision. And as it respects the light on the *Isabella*, it was in the hand of the master, who was moving about on the boat at the time, and, under the circumstances, we cannot but be of opinion that if proper attention had been given to the navigation of the *Commerce*, it would have aided in admonishing the pilot of her position as one of the tows of the *Indiana* instead of confusing or embarrassing him. The pilot of the *Oregon*, who had charge of that vessel and who was several hundred feet behind the *Commerce*, had no difficulty at the time in regarding this vessel with the light as the tow of the *Indiana*, and apprehended a collision from the moment of the sheer of the *Commerce*. The channel of the river was only from three to four or five or six hundred feet wide at the place of the collision in which were the *Indiana* with her ten tows ascending slowly the river—the *Commerce* and *Oregon* descending, and in respect to which navigation some embarrassment existed; and yet, the weight of the proof is, that the speed of the *Commerce* was not checked till at the moment of the collision, nor any of the usual precautions taken under such circumstances. The *Oregon* immediately checked her speed, and took measures to prevent any accident.

LIABILITY OF RAILROADS AS COMMON CARRIERS.

In the *Morris Courts*, on the 21st of October, 1857, the case of *John C. and Lewis D. Kay vs. the Morris and Essex Railroad*, was tried. The plaintiffs alleged that they had bought rags to the value of over \$300 in New York, which had been consigned to the railroad company as common carriers, to be delivered to them at Morristown. Since the consignment the goods had not been seen nor heard from, although frequently demanded of the defendants.

The plaintiffs claimed damages for the full value of the rags, with interest on the same since the date of the demand. It was admitted that the goods were

RAILWAY, CANAL, AND TELEGRAPH STATISTICS.

RAILROADS IN INDIA.

MR. JULAND DANVERS, the government director of the Indian railway companies, states, in his annual report, just issued, that the present system of guaranteed railways comprises a length of 4,917 miles, of which 3,186 are now open for traffic. The net profits in the year ending the 30th of June, 1863, on 2,151 miles of railway, amounted to 690,834*l*, and to 975,077*l* in the year ending 30th June, 1864, on 2,489 miles. The number of passengers conveyed in the latter year was 11,781,683, compared with 9,242,540 in the former. The total expenditures of capital on the lines which are now open, or in course of construction, amounted, on the 1st of May, 1865, to 54,942,029*l*. The expenditure this year, it is estimated, will amount to rather more than 5,000,000*l*—about 1,800,000*l* to be expended in England, and 3,350,000*l* in India. The total amount estimated to be required for the undertakings, as now sanctioned, will reach 77,500,000*l*. The number of shareholders at the end of the year 1864 was 29,303 in England, and 877 in India—the latter number consisting of 384 Europeans and 393 natives. There were also 6,453 debenture holders. Up to the end of 1864 the government had advanced 13,160,539*l* to the railway companies for guaranteed interest, but about 3,300,000*l* had been paid back out of the earnings of the railways, leaving 10,000,000*l* still due to the government. The charge upon the government was 2,567,743*l* in the past year, and by the 1st of January next it will probably have increased to 2,700,000*l*; but the receipts from traffic, which go in diminution of this, and which in the year 1863-'64 amounted to 1,000,000*l*, will in 1864-'65 probably reach 1,300,000*l*. Year by year the revenue will approach nearer and nearer to the amount of guaranteed interest, and at last the government will not only be relieved of the annual payment altogether, but the railways will begin to earn more than the guaranteed rate, and to discharge their debt for previous advances out of half the excess profits above five per cent. Although it will be some time before the government will receive back the large sum due to them, there is enough in the present condition of the lines to encourage the hope that ultimately it will be paid, and in the mean time the State obtains advantages which fully compensate for the liability it has incurred. Mr. Danvers holds that no country in the world will derive greater advantages from railways than India; that the traffic on the main line may be expected to be enormous; and when they earn six, eight, or ten per cent, the difficulty which now exists in inducing capitalists to promote public works in India will be removed.

RAILROADS IN TEXAS.

The railroads already constructed and now in running order in this State are the Houston and Texas Central Railroad, from Houston to Millican, distance 80 miles. Washington County Railroad, from Hempstead to Brenham, distance 30 miles. Buffalo Bayou, Brazos and Colorado Railroad from Harrisburg to Alleyton, distance 80 miles. Houston Tap and Brazoria Railroad from Hous-

ton to Columbia distance 45 miles. Galveston, Houston and Henderson Railroad, from Galveston to Houston, distance 50 miles. Texas and New Orleans Railroad, from Houston to Beaumont, distance 65 miles. Besides these, there is a railroad in running order from Shreveport, La., to Marshall, Texas, distance 40 miles. A railroad is now being built from Brazos Santiago to Brownville, distance about 30 miles, and one from Indianola to Victoria, distance 40 miles.

VIRGINIA AND TENNESSEE RAILROAD.

The annual report of the Board of Directors of the Virginia and Tennessee Railroad, for the fiscal year ending June 30, 1865, exhibits the following facts:

The gross earnings of operating were.....	\$3,291,907 37
The expenses of operating were.....	2,930,504 76

Net earnings above operating expenses....	\$301,402 61
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The net earnings are 9.16 per cent, and the expenses of operating 90.84 per cent of the gross earnings.

There have been six different raids during the year by the armies of the United States, and the road destroyed each time for long distances. Much property was also destroyed by the soldiers of the Confederate States, and to such an extent were these injuries committed, that there is now upon the road only three bridges, original structures, left standing, and but three depots.

The road was open for its entire length one hundred and forty-three days during the year; for ninety-one days was closed nearly its whole length, and for one hundred and thirty-one days closed the entire distance. The depots are yet unbuilt, but the bridges were repaired as speedily as possible, and the entire amount, 7,729 feet, replaced with new structures (trestle work), which will, in a majority of cases, last four or five years. One or two are in danger from high water, and will be replaced by truss bridges, similar to the original structures, as quickly as possible. The wood sheds, water stations, etc., were destroyed the same time with the depots, but are now repaired, and freight cars are now used for the reception and distribution of freight until new depots can be built. There were destroyed at the same time seventy-two passenger and freight cars and three locomotives.

INDIAN RAILROADS.

The through line from Lahore to Mooltan on the Indus is now in operation. The Branch Line of the Great Bombay and Calcutta which pierces the cotton country to Nagpore is making great progress; and the contractors who have this line from Lahore or Umritsir to Meerut and Delhi in hand, are hard at work. The only break which remains to be considered is that along the desert side of the Indus from Mooltan to Kotree, the terminus of the line from Kurrachee; and this will soon have to be connected by iron links. Then Calcutta will be in direct communication by rail with Kurrachee, 2,000 miles off, with Bombay, 1,600 miles off, and with Nagpore, 1,100 miles off. Whether we look at the magnitude and solidity of these works, or at the distance which they traverse, the railroads of India will far surpass any like works in Europe, and closely compete with the greatest projected works in America. They will cover 5,000 miles, and cost £70,000,000 sterling (350,000,000 dollars.)

been wise to examine that part of the neck of land which nature points to as affording the most probable solution of the difficulty. I heard, at Panama, accounts of a depression in the Cordilleras at a point where the two seas approximate so closely to one another, that the natives are in the habit of making a portage with their canoes, from the waters flowing into the Gulf of Mexico into those which lose themselves in the Pacific; and I was not sorry, in company with a fellow-countryman, to join a Frenchman, a German, and a Spaniard, who were about to start on a visit to some property one of them had recently purchased in that direction, in the hope that I might gain some information relative to so interesting a subject. The limited time at my disposal unfortunately precluded the possibility of my attempting anything in the shape of regular exploration. About thirty miles to the southeastward of Panama, the river Bayanos enters the Pacific, almost dividing the Isthmus at a point where the distance from sea to sea does not exceed thirty miles in a direct line. This was the river we proposed ascending, in the hope, at all events, of finding out something from the Darien Indians who inhabit this narrow strip of territory, and whose inveterate hatred to Europeans has operated hitherto as an effectual barrier to any attempt at penetration into their country. * * * From Chepo a depression of the chain was perfectly visible. The distance from Terabla to the Gulf of Mexico cannot be more than fifteen miles; yet, although comparatively so near Panama, no one has attempted to traverse the country. An armed party would be indispensable for the purpose, as the Darien Indians are the most ferocious tribe in the country, and well skilled in the use of poisoned arrows and the blowpipe. The very circumstance of their so jealously resisting the entrance of a white man into their district, goes far to show that they are conscious of its holding out some unusual inducement to his stay there. It is, indeed, confidently asserted, upon information gained from them, as I have before said, that they constantly transport canoes of some size across this watershed."

RAILROADS IN THE UNITED STATES.

We derive from the "American Railroad Annual, compiled from official sources by R. S. FISHER, Esq.," and published by Dinsmore & Co., New York, the annexed tabular statements of the railroads in the United States, on January 1, 1858:—

States.	No. of companies.	Length of lines.—		Cost of construction and equipment.
		Total.	Open.	
Maine	14	586½	541½	\$17,963,677
New Hampshire.....	15	594½	559½	17,597,703
Vermont.....	8	585½	521½	20,523,998
Massachusetts	47	1,413½	1,283½	63,384,310
Rhode Island.....	2	63½	63½	2,586,512
Connecticut	11	659	647½	24,348,963
Total six New England States.	97	3,884½	3,617	\$146,805,163
New York	42	2,893½	2,700½	103,407,268
New Jersey	16	621½	529½	24,825,970
Pennsylvania	68	3,453½	2,773½	135,166,609
Delaware	3	91½	91½	1,619,310
Maryland	10	844½	798½	44,357,831
Total five Middle States.....	139	7,904½	6,893½	\$309,376,488
Virginia	19	1,465½	1,321½	37,705,049
North Carolina.....	5	706	675	11,126,486
South Carolina....	9	974½	748½	17,601,944
Georgia	14	1,361	1,185½	24,952,153
Florida.....	4	521	128	3,500,000
Total five Southern States.....	51	5,028	4,058½	\$94,885,632
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States.	No. of companies.	Length of lines.—		Cost of construction and equipment.
		Total.	Open.	
Alabama	7	1,160½	558½	15,253,771
Mississippi	5	404	177	5,515,009
Louisiana	8	995	335	11,032,362
Texas	5	1,565	147	5,000,000
Arkansas	1	146	38½	775,000
Tennessee ...	9	1,116	887½	19,350,890
Kentucky	9	666½	304½	10,197,414
Total seven Southwestern States.	44	6,053	1,438½	\$67,123,946
Ohio	29	3,298½	2,798½	106,043,328
Indiana	16	1,461	1,231	28,801,276
Michigan	5	1,025	999	30,390,858
Illinois	18	2,616	2,616	86,446,291
Wisconsin	10	1,962	718	19,295,842
Iowa	7	1,076	256	9,087,529
Missouri	4	798	317	19,140,247
Total seven Northwestern States.	89	12,226½	8,935½	\$299,205,371
California	1	22½	22½	750,000
Grand total	421	35,137½	25,965½	\$918,146,600

STATISTICS OF POPULATION, &c.,

ILLEGITIMATE POPULATION, INFANTICIDE, ETC.

The special committee of the Board of Councilmen of the city of New York, which had been appointed to consider the propriety of establishing a Hospital for Foundlings, held a meeting on the 11th of December, 1857, at which Dr. JAMES WYNNE submitted an interesting statement of facts concerning Foundling Hospitals, etc. We now publish an outline of his statement, using, substantially, the report given of it by the *Courier and Enquirer* :—

“The establishment of such institutions occupied a prominent position among the public charities of European countries. Nations of Latin origin opened these hospitals for the reception of foundlings of every class and description, while those of German origin confined their use to infants who had lost one or both parents. St. Vincent de Paul was the champion of the former system, and Herman Franke of the latter. France, Belgium, Italy, Spain, Portugal, Austria, and Russia have adopted the former system, and England, Holland, Sweden, Denmark, Prussia, Switzerland, a considerable part of Germany, and of the United States, the latter. The legislator should look upon these institutions as of absolute necessity, arising as they do from the vices or infirmities of human nature. The first Foundling Hospital known in history was that of Milan, founded in 1787. That founded at Paris by St. Vincent de Paul in 1640, is the most extensive and useful establishment of the kind now in existence. Prior to 1835, a turning-box was used, in which the children were secretly deposited by their mothers; but since that time a certificate from a Commission of Police is necessary to secure the admission of an infant into the Hospital. Statistics of places where these hospitals are established show a slight decrease in the number of illegitimate births.”

On the subject of infanticide, Dr. W. said :—

“In the city of New York, according to the reports of the City Inspector's

VESSELS EMPLOYED IN THE COASTING TRADE OF THE UNITED KINGDOM.

An Account of the Number and Tonnage of Vessels which entered inwards and cleared outwards with cargoes, at the several ports of the United Kingdom, during the year ended 5th of January, 1844, compared with the Entries and Clearances of the preceding year; distinguishing the Vessels employed in the intercourse between Great Britain and Ireland from other Coasters, (year ending 5th January, 1843 and 1844.)

ENTERED INWARDS.

	1843.		1844.	
	Ships.	Tonnage.	Ships.	Tonnage.
Employed in the intercourse between Great Britain and Ireland,.....	9,060	1,148,907	10,104	1,255,901
Other coasting vessels,.....	118,780	9,636,543	121,357	9,566,275
Total,.....	127,840	10,785,450	131,461	10,822,176

CLEARED OUTWARDS.

	1843.		1844.	
	Ships.	Tonnage.	Ships.	Tonnage.
Employed in the intercourse between Great Britain and Ireland,.....	17,453	1,682,828	16,760	1,670,574
Other coasting vessels,.....	123,557	9,619,829	124,937	9,650,564
Total,.....	141,010	11,302,657	141,697	11,321,138

PRODUCE OF CUSTOMS DUTIES IN THE UNITED KINGDOM.

An Account of the Gross and Nett Produce of the Duties of Customs, in the year ended 5th January, 1844, compared with the Produce of the preceding year, (year ending 5th January, 1843 and 1844.)

	1843.	1844.
Gross receipts of duties inwards,.....	£22,596,263	£22,636,659
“ duties outwards,.....	114,424	137,081
Total gross receipts of customs duties,.....	£22,710,687	£22,773,740
Payments out of gross receipts:—		
For bounties,.....	£480	£208
“ drawbacks,.....	176,366	134,138
“ all'nces on q'ntities over-ent'd, damages, &c.,	68,002	65,291
Total payments out of gross receipt,.....	£244,848	£199,637
Nett receipt of customs duties,.....	£22,465,839	£22,574,103

IMPORTATION OF FLOUR AND GRAIN INTO GREAT BRITAIN.

The Brighton (Eng.) Gazette gives the following statement of the amount of wheat and other grain exported into Great Britain in the last twelve years, and entered for home consumption, with the average price and amount of value, compiled from the annual accounts laid before Parliament by the Board of Trade and Navigation; the estimate of price being averaged from parliamentary documents or from the London Gazette, with the exception of some which are taken from the London Price Current:—

	QUANTITY.	AVERAGE PRICE.	VALUE.
	Quarters.	s. d.	
Wheat,.....	14,739,503	57 1	£42,431,115
Barley,.....	2,097,925	33 1	3,260,523
Oats,.....	2,422,845	21 1	2,587,088
Rye,.....	237,482	33 9	400,666
Peas,.....	935,268	35 8	1,667,894
Beans,.....	988,234	35 3	1,741,762
Buckwheat, &c.,.....	82,500	33 1	136,146
Flour, charge for grinding, estimated.....			382,618
Oatmeal,.....			2,721
Total grain,.....			£52,610,535

RAILROAD STATISTICS.

RAILWAYS IN FRANCE.

Until the commencement of the present session, France had only a few completed railways. These were the Rouen, the Orleans, and the Alsace lines; the lines from Lyons to St. Etienne, from Alais to Beaucaire, and from Andrezieux to Roanne, and some small lines, such as those from Montpellier to Cette, from St. Etienne to the Loire, from Paris to Versailles and to St. Germain, from Mulhouse to Thann, &c. Besides these, the following lines were in course of construction:—From Rouen to Havre, from Orleans to Tours, from Avignon to Marseilles, from Paris to Lille and Valenciennes, from Dijon to Chalons, from Strasburg to Hommaring, from Orleans to Vierzon, and from Montpellier to Nismes, being in all 900 kilometres.* The total extent of railways terminated, and in course of construction at that time, was about 2,000 kilometres. To this number, the acts passed during the present session add 147 kilometres from Lille to Calais and Dunkirk, 124 from Amiens to Boulogne, (for which, without doubt, a company will offer on the terms proposed by the Chamber,) 437 from Paris to Hommaring, besides 87 for the branches to Metz and Rheims; 450 kilometres from Paris to Dijon, and from Chalons to Lyons, with 102 kilometres from Montereau to Troyes; 358 kilometres from Tours to Bordeaux; 192 from Tours to Nantes; 60 from Vierzen to Chateauroux; 87 from Vierzen to the Allier; and 74 from Versailles to Chartres. This makes a total of 2,118 kilometres, to which is to be added the trunk railways upon which the works have been going on since the beginning of last January, at the expense of the state, or with its concurrence, in conformity with the law of 1842, which raises the whole extent to 2,828 kilometres; and, with the Rouen and Havre line, to 2,918 kilometres. Next year, it is certain that to this extent will be added the line from the Mediterranean to the Rhine, (205 kilometres,) and that from Lyons to Avignon, (249 kilometres,) being together 454 kilometres. The rest of the lines comprised in the act of 1842 will be afterwards proceeded with; namely, from Nevers to Clermont, from Chateauroux to Limoges, from Chartres to Renues, from the Atlantic to the Mediterranean, and from Bordeaux to Bayonne; being, in all, 1,320 kilometres. The works are either about to commence, or have already commenced, on 2,821 kilometres; which, at an average expense of 300,000 francs per kilometre, will amount to an outlay of 850,000,000 francs, of which about 500,000,000 are at the expense of the state. With the probable votes of next year, the general expense of the railroads will be 1,540,000,000 francs, (61,600,000*l.* sterling; and in seven years the whole system will be completed.

The *Courrier Francais*, of a late date, publishes the following return of the amount of capital, in railroad shares, to be issued by the companies of the different lines, of which the construction will be authorized by the French Chambers, during the present session:—

	Francs.	Dollars.
The Paris and Belgian Railroad, not including the branch road between Amiens and Boulogne,.....	75,000,000	14,062,500
Paris and Strasburg,.....	70,000,000	13,125,000
Paris and Lyons,.....	100,000,000	18,750,000
Lyons and Avignon,.....	60,000,000	11,250,000
Orleans and Vierzon,.....	40,000,000	7,500,000
Orleans and Bordeaux,.....	70,000,000	13,125,000
Tours and Nantes,.....	30,000,000	5,625,000
Versailles to Chartres,.....	10,000,000	1,875,000
Total,.....	455,000,000	85,312,500

* A kilometre is about 1,094 yards—an English mile is 1,760 yards.

SOUTH CAROLINA RAILROAD.

The following statement, originally prepared for the Charleston Courier, was taken from the books of the company. The prosperous condition of this great and important enterprise must be gratifying, indeed, not only to the stockholders, but to every citizen interested in the welfare of Charleston. There is every reason to believe that its income will go on increasing; and, from the fact that there can be no competition with them, of such a magnitude as to affect their business, and the disposition shown to keep the charge for freight at a reasonable rate, it is believed that the stock is destined to become as productive as any in the country.

1843.	Receipts.	1844.	Receipts.
July,.....	\$14,726 26	July,.....	\$19,488 80
August,.....	13,585 02	August,.....	21,447 07
September,.....	30,765 22	September,.....	41,103 13
October,.....	55,390 54	October,.....	70,451 05
November,.....	47,231 84		
December,.....	42,349 32		
1843—from July to October, inclusive,			\$114,467 04
1844—“ “ “			152,339 00
			114,467 04
Gain in four months, on road,			\$37,871 96
Income of the road, from July to October, 1844,.....			152,329 00
Allow that November and December, 1844, only equal the same months of 1843, and there is no doubt of their exceeding that amount in the same ratio as the four preceding months,.....			89,580 00
Add, for the bank dividend,.....			17,500 00
Contract for mail and other sources, \$4,000 per month,.....			24,000 00
			\$283,409 00
Six months' expenses, at \$30,000 per month,.....			180,000 00
			\$103,409 00
Thirty-four thousand shares, six months' dividend, at three,.....			102,000 00
			\$1,409 00
Surplus,.....			

As far as November had been brought up, the past week, this year, has produced \$14,157 39; the week corresponding, last year, was \$11,353 12.

WEST INDIA STEAMERS.

The financial affairs of the West India Steam Company appear in a prosperous state. Agreeable to a recent statement of the directors, exhibiting the receipts and disbursements for the half year ending June 30, the receipts exceed those of a similar period, in last year, by £16,879 02.

Receipts from January 1 to June 30, 1844,.....	£174,927 16 8
“ “ “ “ 1843,.....	158,048 14 7
The above includes the government contract for mail service, of £120,000.	
The disbursements, during the same period, were, in 1844,.....	\$108,770 1 11
And in 6 months of 1843,.....	123,706 19 0
Excess of receipts over disbursements, 1844,.....	66,157 14 9
“ “ “ “ 1843,.....	34,341 15 7

It is contemplated to build another steamer for the conveyance of the mail between Jamaica, Carthage, &c., heretofore carried by a sailing vessel. The directors announce that they have paid, since their last meeting, £20,000 of their debt, and intend paying off their loan of \$50,000, borrowed in 1842.

RAILWAYS IN ENGLAND, ON THE CONTINENT, &c.

In Germany, at the present time, (1844,) there are 1,339 miles of railroad completed, 589 in the course of construction, and 3,096 projected. Germany has 152 miles of railway completed for every million of inhabitants; France, 16; Belgium, 50; England, 86; the United States, 222. Great Britain has 1,800 miles of railroad completed, that have cost \$300,000,000; the United States, 4,000 miles—\$125,000,000. France has only 560 miles completed. Several years have been lost to devise a plan for the government to afford aid to private corporations to construct and manage railways, they giving to the government the privilege to transport the mails, troops, and munitions of war, at fixed rates. On this plan, France will soon be covered with railways.

Russia, after her first success in a short road of 16 miles, is now constructing a road from St. Petersburg to Moscow, 400 miles long, superintended by American engineers, with Americans in her work-shops to learn her to make locomotives, cars, &c. Russia has also a work projected of 1,000 miles in length, to connect her capital with the Caspian and Black seas. The following is a view of the railways about to be constructed in the several states of Germany:—

	Miles.	To cost		Miles.	To cost
Austria,.....	770	£5,440,000	Brunswick,.....	81	£475,000
Bavaria,.....	228	1,656,000	Darmstadt,.....	70	730,000
Wurtemberg,.....	174	3,024,000			
Baden,.....	217	2,016,000	Total,.....	1,872	£14,995,000
Hanover,.....	272	1,650,000			

In enumerating these extended lines of railways on the continent, and in Great Britain, we do not read of a single new canal projected, or in the course of construction. Railways judiciously located, and constructed between desirable points, are sure to be safe investments.

In England, the late official returns show a falling off in the receipts of canals, side by side with railways, of from 33 to 66 per cent; while about this ratio of increase in freight has been added to railways. The canal property was worth £200, £300, and even as high, in one instance, as £1,200 per every £100 paid. Since the complete success of railways, to carry all classes of freight, this class of stocks have fallen, since then, 50 per cent on their former value; while the railways have steadily advanced in prices, and 2,000 miles of new railways are projected, at an estimated cost of \$70,000,000. In England, the long lines pay 6 to 10 per cent dividends, as a whole—near 5 per cent per annum, on \$300,000,000. New England has \$26,000,000 invested in railways, that now nets 6 per cent. The whole line to Buffalo from Albany, 320 miles, costing about \$7,000,000, nets 7 per cent. Yet, under this view, we have individuals in this state who would expend \$25,000,000 more to enlarge the Erie canal, while less than half this sum would give us a complete double track, from Buffalo to New York, open all the year, and at rates of transportation as low as by the canal, if not lower.

J. E. B.

PARIS AND LONDON RAILWAYS.

The establishment of the railroads from London to Portsmouth, from London to Dover, and from Paris to Rouen, have facilitated the communication between the two great capitals of Europe. But the journey has not yet been rendered so short, and so easy of accomplishment, as might have been anticipated. At length, however, a grant has been made by the French government, to a private company, of the privilege of establishing a railroad from Amiens to Boulogne, which will, when completed, probably constitute the shortest and most frequented route of communication between these two capitals. On the 16th of October, the privilege of constructing a railroad on this route was adjudged to Messrs. Charles Lafitte, Blount & Co., for a term of 98 years and 11 months.

This company is not to enjoy the benefit of having the cost of grading, and of the works of art, defrayed by the government. The whole work is to be done at the expense of the company. It is thought, nevertheless, that the amount of travelling between these two great cities will be such as to insure a liberal profit to the company. The *Paris Journal des Debats*, in speaking of this enterprise, remarks that "it is no exaggeration to say that the cause of civilization in general will derive a great benefit from it. By means of this railroad, the two great centres of knowledge, of the arts, and of liberty, will be brought within twelve hours' travel of one another. Within the space of three years, in all probability, it will be made easy, by means of this railroad, to make the journey from Paris to London between the rising and setting of the sun, during a great part of the year."

RAILROAD TAXATION IN ENGLAND.

It is stated, in the *London Railway Times*, that the gross receipts on 2,000 miles of English railway, for 1843, were £7,002,004; the working expenses, £2,222,924; the government duty paid, £191,081; interest on loans, &c., £1,070,000; local rates and taxes, £156,000; forming a total expenditure (estimated) of £3,023,824; leaving only £3,111,000, (upon an invested capital of 80 to 100 millions,) for "dividend," and subject to income-tax, &c. Taking ten acres to a mile of railway, those 2,000 miles would give 20,000 acres of land; which, as land, would be assessed at £14,000, paying a rate of £4,000; but which, as railway, is assessed at £780,000, at least, paying £156,000 a year rates; and that amount is fast increasing. Irish, Scotch, Welsh, and continental railways, and English canals, &c., are exempt from this principle and burden of taxation. Besides these contributions, those 2,000 miles of railway pay income-tax £90,000, besides land-tax, tithe-assessed taxes, &c.; and their property is assessed, for the purposes of taxation, at 48 times its legitimate amount, which is gradually increasing; and that assessment forms the guide for railway contribution to the 12 millions of yearly local taxation, the 5 millions of tithe, the $1\frac{1}{4}$ million of land-tax, besides the assessed taxes, sewers, and state taxes.

INCOME OF THE MOHAWK AND HUDSON RAILROAD.

The following is a comparative table of the earnings of the Mohawk and Hudson railroad, for the years ending October 31, 1843 and 1844:—

1842—November,.....	\$5,039 25	1843—November,.....	\$6,047 42
December,.....	2,350 74	December,.....	3,918 02
1844—January,.....	1,905 51	1844—January,.....	2,029 80
February,.....	1,469 49	February,.....	2,552 31
March,.....	1,609 62	March,.....	3,300 92
April,.....	4,677 43	April,.....	7,665 12
May,.....	6,447 06	May,.....	6,583 27
June,.....	5,050 87	June,.....	6,432 05
July,.....	6,568 97	July,.....	7,915 39
August,.....	7,565 90	August,.....	9,609 58
September,.....	5,233 52	September,.....	8,888 31
October,.....	6,791 31	October,.....	9,075 39
Total,.....	\$54,700 67	Total,.....	\$74,018 08
			54,700 67
Excess in favor of 1844,.....			\$19,317 41
The receipts for the two weeks ending Nov. 14, were.....			\$2,943 61
Same time last year,.....			2,802 00
Excess in favor of 1844,.....			141 61

OPENING AND CLOSING OF THE NEW YORK CANALS,

IN EACH YEAR, FROM 1824 TO 1844.

The business of the canals of New York closed about the 28th of November. By the use of ice-breakers, portions of the canal were kept open, however, a few days longer, to enable boats in the vicinity to reach their winter-quarters. The following table will show the commencement and close of navigation for each year, since 1824:—

Year.	Commence- ment.	Close.	No. of days.	Year.	Commence- ment.	Close.	No. days.
1824,.....	April 30	Dec. 4	219	1835,.....	April 17	Nov. 30	230
1825,.....	" 12	" 5	238	1836,.....	" 25	" 26	216
1826,.....	" 20	" 18	213	1837,.....	" 20	Dec. 9	234
1827,.....	" 22	" 18	241	1838,.....	" 12	Nov. 25	228
1828,.....	Mar. 27	" 20	269	1839,.....	" 20	Dec. 16	228
1829,.....	May 2	" 17	230	1840,.....	" 20	" 3	215
1830,.....	April 20	" 17	242	1841,.....	" 26	Nov. 21	218
1831,.....	" 16	" 1	230	1842,.....	" 20	" 23	215
1832,.....	" 25	" 21	241	1843,.....	May 1	Dec. 1	214
1833,.....	" 19	" 12	238	1844,.....	April 18	Nov. 28 pro.	224
1834,.....	" 17	" 12	240				

INCREASE OF RAILROAD TRAVEL.

The receipts on ten of the following works, to the 1st September, shows an increase of \$800,357. The receipts on all the public and private works—railways, canals, and turn-pikes—in the different states, in 1844, compared with 1843, will present an increase of four millions of dollars, or an enhanced value of eighty millions of dollars, calculated on an interest of 5 per cent.

	1843.	1844.	Increase.
Utica and Schenectady,.....	\$155,044	\$179,078	\$24,034
Tonawanda, to August,.....	27,033	52,022	24,988
Buffalo and Attica, August,.....	20,929	34,179	13,250
Norwich and Worcester,.....	91,911	140,060	58,149
Western Railroad,.....	346,556	460,677	114,121
New York Canals,.....	858,445	1,137,717	279,272
Pennsylvania,.....	578,879	714,801	140,922
Reading Railroad,.....	232,637	365,004	132,367
Southern Railroad,.....	1,452	4,364	2,911
Hartford and New Haven Railroad, ..	89,288	99,632	10,343

These various lines all show a very favorable state of things, and clearly demonstrate that, for investment, railroad shares are as profitable as bank shares, and but little short of manufacturing stocks.

INTERNAL IMPROVEMENTS OF OHIO.

Ohio seems to be participating most abundantly in the prosperity of public works. The following is a statement of income for two years, ending the middle of May:—

	1842-43.	1843-44.
Ohio Canal,.....	\$47,480 76	\$94,530 04.
Medina,.....	28,873 15	43,446 82
Medina Ex., (unfin., will be compl. this year,)	2,754 61	5,253 27
Wabash and Erie,.....	948 39	12,812 23
Hocking,.....	660 16	1,692 12
Walhonding,.....	105 63	584 23
Muskingum Improvement,.....	7,904 78	14,340 70
	<hr/> \$88,729 48	<hr/> \$172,659 41
		88,729 48
Increase in 1844,.....		<hr/> \$83,929 93

	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Manufactures of pewter and lead.....	.....	\$46,081	.....	\$30,534	.....	\$23,832
Marble and stone.....	.....	176,289	.....	185,267	.....	195,442
India rubber boots and shoes.....	.....	58,826	.....	38,605	.....	35,903
Do other manufactures of.....	107,693	182,015	62,729	160,088	25,116	107,953
Gold and silver leaf.....	.....	140,187	.....	53,372	.....	63,078
Jewelry, &c.....	.....	24,659	.....	48,740	.....	67,750
Artificial flowers.....	.....	207	.....	1,459	.....	130
Trunks and valises.....	.....	50,184	.....	40,622	.....	50,771
Lard oil.....	60,269	55,783	85,676	81,733	239,608	148,056
Oil cake.....	.....	1,609,328	.....	1,386,691	.....	875,841
Bricks, lime and cement.....	.....	154,045	.....	93,292	.....	83,385
Unenumerated manufactures.....	.....	2,397,445	.....	2,530,689	.....	1,986,976
Total Manufactures.....		<u>\$39,544,898</u>		<u>\$35,786,804</u>		<u>\$25,066,000</u>
Coal.....	187,059	\$740,783	153,171	\$577,386	213,046	\$837,117
Ice.....	49,153	183,134	44,753	172,263	48,390	182,667
Petroleum, crude and refined.....	.....	.....	.....	.....	5,828,129	1,539,027
Quicksilver.....	.....	258,682	.....	631,450	.....	1,287,643
Gold and Silver Bullion.....	.....	30,913,173	.....	13,311,280	.....	13,267,739
Gold and Silver Coin.....	.....	26,038,678	.....	10,488,590	.....	17,776,912
Raw Produce not specified.....	.....	1,355,391	.....	2,794,046	.....	1,067,703
Total Exports of Domestic Products...		<u>\$373,189,274</u>		<u>\$237,966,169</u>		<u>\$213,060,247</u>

RAILWAY NEWS.

RAILWAYS IN SPAIN—THE PYRENEES TO BE TUNNELLED.

A FEW years ago Spain was as innocent of railroad conveniences as she was in the days when Don Quixotte bestrode his Rosinante and set forth in search of adventures for the honor of Dulcinea del Toboso. The Dons had heard of the the modern invention, and thought, doubtless, that the devil had much to do with it ; but the muleteers, as they toiled over the sunny vine-clad hills, whistled in stolid indifference, and with full confidence that their business was not to be broken in upon by the tireless industry and force of the iron horse. The dream, however, has passed ; and now the city of Madrid is connected by railroad with all the frontiers of the kingdom—with the Mediterranean by way of Alicante, Valencia, and Barcelona ; with the ocean by way of Cadiz to the south and of Santander to the north ; with Portugal by way of Estremadura and Badajoz, famed in war-like story, and with France by way of the Basque provinces and Irun.

The length of the lines conceded, according to returns published in 1864, was 3,781 miles ; that worked, 2,230 miles. The concessions were made to as many as 37 different companies. The capital raised by shares was about £24,000,000 sterling ; and by the issue of debentures, rather more than £25,000,000. The subventions which the government undertook to allow were £12,600,000 ; but only about half of them were actually paid. The average receipts per mile are not clearly stated, but they were slightly less than in 1862. In the first six months of 1864, compared with the corresponding period of 1863, some of the principal lines, however, showed a marked advance—in the north of Spain, of as much as 23 per cent ; Seville, 20 ; Pampeluna, 12 ; Barcelona, 4. French capital, as is known, is very largely invested in Spanish lines ; and the French now see that, in order to enable them to prosper, it is absolutely necessary that a radical reform should be made in the customs system of Spain—a reform which by abolishing many of the import duties and reducing the rest, shall permit the introduction of foreign merchandise in considerable quantities. Unfortunately, however, Spanish cabinets show no disposition to reform the commercial *regime* ; and so little inclination is there in Spain to befriend railways, that a tax of 10 per cent of the receipts of express trains has just been imposed.

The companies enjoy the privilege of importing the materials for the work free of duty. The construction of the line to the French frontier necessitates the construction of a tunnel through the Pyrenees—almost as great a work as that of tunnelling the Alps. The elevation is to be six feet in one hundred.

PACIFIC RAILROAD TO BE COMPLETED—ISSUE OF BONDS BY ST. LOUIS.

THE County Court of St. Louis, at its session December 18th, ordered the issue to the President and Directors of the Pacific Railroad Company, bonds to the amount of \$700,000, being the same that the County Court was authorized to issue by the recent act of the Legislature. This loan of the county credit is

LEADING BRITISH RAILWAY SHARES IN 1851-52.

The following comparative statement of the closing prices of the leading railway shares, at the close of the years 1851 and 1852, will be found interesting:—

Railways.	December 31, 1851.			December 31, 1852.			Difference in 1852. Per share.
	Paid.	Closing Prices.		Paid.	Closing Prices.		
Aberdeen	£50	12	12½	£100	31½	32	£7 10 high.
Bristol and Exeter	100	81	83	100	106	108	25 0 "
Caledonian	50	16¾	16½	100	67	67½	34 5 "
Edinburg and Glasgow.....	50	27	29	100	78	80	24 0 "
Great Southern and Western, (Ireland.....)	50	35½	35¾	100	105	107	34 15 "
Great Western.....	100	87	88	100	95½	95¾	8 5 "
Lancaster and Carlisle.....	50	78	80	50	88	90	10 0 "
Lancaster and Yorkshire.....	100	60½	61	100	84¾	85½	24 5 "
London and Brighton	100	95½	96½	100	107½	108½	12 0 "
London and North-Western...	100	117½	117¾	100	125½	126½	8 10 "
London and South-Western....	100	86	87	100	91½	92½	5 10 "
Midland.....	108	57¾	58½	100	80	80½	22 5 "
Norfolk	100	22	24	100	54	56	34 0 "
Oxford, Worcester & Wolverton.	50	15	15½	100	51	53	21 0 "
Scottish Central.....	25	14¾	15¼	100	94	96	35 0 "
York, Newcastle, and B'wick...	25	18½	19	100	72½	73½	1 10 lo'er.
York and North Midland	50	23	23½	100	59½	60½	13 10 high.

THE RAILWAYS OF FRANCE.

The annexed table, from the Paris *Moniteur*, exhibits the length in miles, and earnings in dollars, of the railways of France, at the close of and for the year 1852, compared with the receipts for the previous year.

Names.	Miles worked.	Receipts for 1852.
North, Paris and Bologne, &c.....	441	\$5,597,535
Auzon and Somain.....	11¾	36,245
East, Paris and Strasbourg.....	240¾	3,070,191
Mulhouse and Thann.....	13	34,486
Strasbourg and Basle	87½	504,682
Paris and Lyons.....	237¾	3,353,663
Montereau and Troyes.....	62	263,609
Saint Etienne and Lyons.....	41	947,458
Saint Etienne and Andrezieux.....	11¼	85,316
Andrezieux and Roanne	42¼	184,864
Avignon and Marseilles.....	74½	811,038
Railways of Gard.....	57¾	729,248
Montpelier and Nimes.....	33	
Montpelier and Cette	17½	
Bordeaux and Teste	33	50,400
West, Paris and Chartres	61½	538,451
Paris and Versailles, left bank.....	10¾	153,754
Paris and Versailles, right bank.....	14½	320,803
Paris and Rouen	87	1,819,064
Rouen and Havre	57½	730,793
Dieppe and Fecamp	31¾	169,215
Paris and Orleans and Corbell.....	82½	5,007,067
Centre Railroad.....	151½	
Orleans and Bordeaux.....	157¾	
Tours and Nantes.....	121¾	280,248
Paris and St. Germain.....	16½	
Paris and Scéen.....	6½	53,025
Total	2,303	\$24,735,938
Total receipts for 1851		20,002,912
Excess in favor of 1852.....		\$4,733,056

This excess of nearly five millions of dollars in the receipts of the year 1852 over those of 1851, is to be attributed mostly to the completion or extension, during the year that has just closed, of several of the most important lines of railways radiating from the capital to the frontiers. The Eastern Railway from Paris has been opened to Strasbourg, on the Rhine, and several sections completed on the Western road, and on those destined to connect Bordeaux, Marseilles, and Lyons with Paris. The number of additional miles of railway opened to travel and traffic during the year 1852, throughout the whole empire, was 249 miles. The four railways of which the receipts per mile were largest, during the year 1852, were those connecting St. Etienne and Lyons, Paris and Versailles, (right bank of the Seine,) Paris and Rouen, and Paris and St. Germain. The same order was observed in 1851, though the profits of all the railways in France have increased. The four yielding the least income per mile are the Bordeaux and Teste Railway, Mulhouse and Thann, Auzon and Somain, and Montereau and Troyes. The grand average receipts per mile for all the railways, in 1851, was \$10,737.

A legal decision of some importance to the railway managers and the public, has lately been given in Paris. The passengers upon the Lyons and Mediterranean Road arrived one day last September too late to connect with the branch to Avignon. They had to spend the night at Tarascon, and a portion of them sued the company for damages. The company took the general ground that it could not in any case be responsible for any losses resulting from the non-arrival of trains at the specified hours. But it was decided that when the non-arrival is due to the negligence of the employees, the company must be held responsible, and that it should pay to the sufferers damages proportionate to their losses, not exceeding forty dollars, nor less than six dollars a-piece. If this kind of law were in force in the United States, the owners of some of the railways, steamers, and stage coaches would suffer annually to considerable of a figure. The principal railways of France seem to be highly prosperous, and very many of them are bringing a handsome premium over the cost.

STEAMBOATS BETWEEN NEW YORK AND BOSTON.

The Steamers which ply between New York and Boston, via Fall River and Stonington, are unsurpassed for comfort, safety, and speed, on any similar route in the world. We find the following notice of these boats in "*An Englishwoman's Experience in America.*" MARIANNE FINCH, the author of that work, took passage, as we understand, in the "Empire State," of the Fall River Line.

"Two days afterwards we landed at New York, after a passage of eleven days and a half. We dined on shore, and then proceeded to Boston by boat. The word 'boat,' gives a very imperfect idea of this floating palace, which accommodates at the very moderate charge of four dollars each, from five to six hundred American citizens and others, of all classes, in a style of splendor that Cleopatra herself might envy. Her barge with the sails of purple silk, in which she received Marc Antony, was nothing to it. There is little to remind one of machinery; for the paddle-wheels are covered, and the engine is rendered invisible by being surrounded with glass and drapery. However, one thing is certain, the vessel moves smoothly and quickly through the water. I followed a crowd of five hundred up a handsome staircase, through splendidly furnished saloons, covered with carpets of velvet pile, to the upper deck.

* * Tea being announced, we all adjourned to the gentlemen's cabin. The apartment was very large, with berths three deep all around it; the curtains of these being drawn, covered the sides with drapery of different colors mixed with lace shades. At the entrance we were met by tall, swarthy figures, clothed in white linen of unspotted purity, who conducted us to our seats. There were three tables, the entire length of the room, covered with every thing that was beautiful; but nothing that seemed eatable, except pineapples and some small, delicate, delicious-looking things that, for want of a better word, I shall call rolls, though it vulgarizes them sadly. Notwithstanding this unreal appearance, you no sooner wished for anything than a ministering spirit was at your elbow to gratify you. At his touch pineapples became butter, pyramids tea-cakes, and magical boxes savoury pies; tongue, ham, and all kinds of delicacies issued from their flowery retreats at his bidding. At the end of the banquet you heard whispered in your ear, 'Half a-dollar.' It was produced, and silently disappeared—not a clink was heard."

OF AND FROM BRITISH POSSESSIONS.

Rice.....cwt.	£0	0	6	Sugar, white, damaged.....	£0	16	4
Cloverseed.....	0	5	0	Sugar, brown.....	0	14	0
Spirits, or strong waters.....gall.	0	8	10	Coffee..... per pound	0	0	4
only the East India spirits				Tallow.....	0	0	1
and strong waters (except				Timber.....	0	1	0
rum) 15s. 4d., and sweetened				Deals, battens, boards, and other			
strong waters, £1 0s. 4d.				timber, sawed or split.....	0	2	0
Sugar, double refined..... cwt.	1	1	0	Staves.....	0	2	0
Sugar, refined,.....	0	18	0				

It is seen that the very recent reduction of duty on timber is almost exclusively for the benefit of the British colonies, especially the Canadas. While formerly foreign timber paid 55 shillings, and that from the colonies 10 shillings a last, now, since the reductions of the duty on the former to 25 shillings, the latter is admitted at a mere nominal rate of duty. This is done, although there is no doubt that the Canadian wood is of an inferior quality to that imported from the ports on the Baltic. McCulloch says :—

“It was proved in evidence taken before a committee of the House of Lords, that timber from Canada is not half so durable as that from the Baltic, and is, besides, particularly liable to dry rot. It is not allowed to be used in the building of ships for the navy, and is rejected by all more respectable house-builders.”

The importance of the advantages given to the colonies by this discriminating duty on timber, may be judged by the fact—which occurred at least under the former tariff—that timber was carried from the Baltic in British vessels to Canada, in order to be re-exported thence, *as colonial timber*, to England.

Similar representations of this nature could be made from the tariffs of the colonies. Thus, for example, at the Cape of Good Hope most foreign goods pay an ad valorem duty of 12 per cent, and British goods only 5. In the West Indies the duties on indispensable necessities of life, the produce of the United States, such as flour, beef, pork, and lumber, deserve special notice, being so arranged as to divert the shipments of these American productions from their own vessels, and to secure the carrying business to the British flag. It will be interesting to hear what the official report, which appeared in the year 1832, on the commercial relations of the United States with foreign nations, says on the subject :—

“The products (flour, beef, pork, and lumber,) are admitted from this country into Canada *free*; but are liable to a duty on importation into the British West India possessions of \$1 20 per barrel on flour; pork, \$2 88 per cwt., and on lumber \$5 04 per 1,000 feet. The amount of these articles imported into the said dependencies of Great Britain is large, but insignificant in comparison with that carried into the provinces over the Canadian frontiers by land, and thus distributed through her North American possessions in her own vessels, &c.

“The gradual extinction of our direct trade with the British West Indies, at least in our own vessels, seems an inevitable result of the present arrangement; the discrimination between duties on articles imported into their colonies directly from the United States, and on the same articles when imported circuitously through the provinces, will eventually turn the whole course of trade in that direction. The duty on flour, beef, pork, lumber, staves and shingles, from the United States, must of course take

this circuitous mode of importation, as they are all admitted free of duty from the provinces; and whatever of direct trade between the United States and the continental provinces does exist, must be enjoyed by British vessels in a very great measure, in consequence of their superior facilities as the ports in those colonies for transportation to the West Indies."

Art. III.—THE RAILWAYS OF ITALY.

DURING the sessions of the eighth Italian Congress, which assembled in Genoa last September, the subject of the present article underwent a thorough and interesting discussion. Committees were appointed to investigate the matter, and a splendid report was presented; which, like every other Italian production, abounded in everything we want except, what must always amount, in such matters, to "the one thing needful"—*facts*. From this report, and other documents which I have collected, I will draw up a brief account for the Magazine, after first giving its readers an idea of the body from whom the report issued.

The *Italian Congress* is composed of the principal learned men of Italy, who, eight years ago, associated together for the promotion of the general interests of science. It will not be necessary for me to tell the readers of your Magazine, that although this Congress was a voluntary association, whose only object was the promotion of the great cause of science and of art, in their application to the economic arrangements of life, it was regarded with suspicion by most of the governments of Italy. It was long before the originators of this institution, which has now grown into so much importance, and really effected so much good in Italy, were allowed to assemble. The governments of the peninsula have been rocked by perpetual disturbances and revolutions, and their suspicions were well-founded against this general and imposing movement. They are well aware that their thrones have no security except in the divisions and dissensions of Italy and her people; for it is quite too evident to need argument, that 24,000,000 of people are too strong for any system of government ever yet established, if they move in concert to its overthrow.

The principal cause, therefore, of the suspicions with which this association was regarded, was its natural tendency to promote Italian union. But the desire, at last, became so universal to consummate this Congress, that it was no longer considered prudent to resist it. The sovereigns of Italy resolved to *guide* the movement, which they did not care to attempt to *crush*.

This Congress is composed of all the most learned professional men of Italy. They assemble annually, in some one of the principal cities of the peninsula, and remain together for about three weeks. During this time, the city gives itself up to a continuous and universal festival. Everything is done by the government and the people, to increase the gaiety and splendor of the occasion. The theatres are open, the best operas are executed by the most famous singers, and the finest tragedies and comedies are recited by the best actors. The most imposing ceremonies are celebrated in the churches, and discourses delivered by the most eloquent preachers. Concerts, soirées, casinos, and public entertainments, are given. Every collection and gallery is thrown open; there are exhi-

bitions of all the most excellent works of fine and mechanic arts produced during the year, throughout Italy, by the artists and workmen of rival cities. Business is suspended, and amusement, gaiety, and splendor, become the earnest and enthusiastic business of the people. It need not be added, that what is generally understood by political discussions, are never even attempted in these congresses. Such an attempt would be immediately discouraged by the majority of the members, if indeed, it were not suppressed by the government; but the discussions are, in other respects, more free than might be expected. Every subject which relates to the natural sciences, or the arts of taste and utility, and the entire physical economy of life, are considered legitimate themes for discussion. Hence railways, which, at the present time, are exciting a deep and unusual interest in Italy, occupy a large space in the congressional proceedings. This subject was very thoroughly examined at the Congress at Genoa, in September. Plans, designs, and proposals, were made for numerous lines; and every one proposed, found numerous and eloquent advocates. The chief questions discussed were:—

1. What shall be the principal seaport-dépôt of the great Italian railway that is to cross the Alps; Genoa, Venice, or Trieste? For it is evident that the commerce of the Mediterranean must find its way into Germany, Switzerland, and the centre of Europe, by one of those cities.

2. Where shall the great central line that is to traverse Italy begin, and what course shall it take in its route through the peninsula?

3. Where shall it penetrate the Alps, to open communication with the central and northern countries of Europe?

4. Would it be better to have one, or *two* lines, traverse Italy? In other words, a great central line beginning at Naples, and passing Rome and Florence, ending at Milan or Genoa, with collateral lines (as they are called) communicating with the seaports on the eastern and western shores of the peninsula—or two great lines, one on either coast? In this case, a road would extend from Nice to Genoa, (100 miles,) from Genoa to Leghorn, (150 miles,) from Leghorn to Civita-Vecchia, (150 miles,) and from thence down to Naples, about the same distance; and another line, beginning at Naples, would traverse the eastern coast of the peninsula up to Venice.

The relative advantages of these two great plans, were warmly discussed; and to have listened to the speeches, a foreigner, unacquainted with Italy, would have supposed that in twelve months the shrill neigh of the iron-horse would be heard throughout all the valleys of Italy. But the Italians, themselves, were still more deluded by their own hopes. There is, probably, no people in Europe who have been so often betrayed, by themselves and by others: there is, probably, no other nation so eager to listen to schemes of national prosperity, or so powerless and inert in carrying them into effect. In fact, the history of Italy, since the era of her great achievements in the middle ages, has been little less than a *feverish dream of indolent hope*. No scheme of national redemption ever proposed, has been too utopian to be embraced by the Italian people, or practical enough to do them any good; and now, when it has been demonstrated to the satisfaction of everybody, that an Italian union is absurd and impossible; when every attempt to elevate the character of the people, and regenerate the governments, has only involved the ruin of reformers; when none but enthusiasts ever *dream* of Italian emancipation,

the public hopes seem to have centered upon railroads as the great secret of modern civilization; and they fancy that when this "steam-coach" goes thundering through their tired valleys, a panacea will have been discovered for all the political, moral, social, and physical woes of Italy. Even the most clear-sighted and acute Italians are pretty thoroughly tinctured with this all-pervading *superstition*—for I can call it by no other name.

I will first speak of the railways that are already in operation in Italy. Second, of those that are being constructed. Third, of those that will probably be constructed in the future. And then, if I have space and time, briefly glance at the resources on which the success of these roads must depend.

I. The Italian railways already in operation :

IN THE KINGDOM OF NAPLES.

From Naples to Portici.....	7,500	kilometres.
Portici to Castellmara.....	18,863	"
Torre della Nunziata to Nocera.....	15,987	"
Naples to Caserta.....	22,220	"
Caserta to Capria.....	15,554	"
Total.....	80,124	kilometres.

IN THE LOMBARDO-VENETO KINGDOM.

From Milan to Monza.....	14,000	kilometres.
Padoa to Mestre.....	30,158	"
Mestre to Venice, (length of the bridge)....	3,548	"
Milan to Padua.....	30,805	"
Padua to Vicenza.....	28,876	"
Total.....	107,383	kilometres.

GRAND DUCHY OF TUSCANY.

From Leghorn to Pisa.....	20,000	kilometres.
Pisa to Ponte.....	21,000	"
Total.....	41,000	kilometres.

General total..... 228,507 kilometres.

That is to say, in all Italy the railways already in operation, amount to about 120 English miles, since 1,000 kilometres are a little less than half a mile. Some other roads are now being opened, and in less than a year, double the present amount will be complete.

II. Railways now in process of construction. The most important, by far, is the line from Genoa to the Alps. This road has long been in contemplation. The government yielded its consent with considerable reluctance, in consequence (it was said) of the violent opposition of Austria. The road was not to traverse any portion of the Austrian States; but Austria, which has, since the downfall of the empire of France, held her oppressive foot upon the necks of Italian princes and people, felt serious objections against the enterprise. This arose from four causes. 1st. The court of Vienna has always been jealous of France, and opposed every movement which tended to promote intercourse between that country and Italy. For this reason, until the present generation, there was no road even from Nice to Genoa, although these two cities both stood on the shores of the Mediterranean, belonged to the same State, and carried on extensive reciprocal commerce. An incident worth relating, finally gave

origin to the beautiful road on which the traveller now winds along the magnificent *riviera* that lies between Genoa and Nice. The Sardinian king, about the year 1820, happening to be detained at Nice (whither he had gone on a royal visit) by a violent storm, which lasted several days, and made it dangerous to embark, said peevishly, to the governor of the town, "Why have you never built a road up to Genoa?" The governor replied, "Your majesty will remember that we have long ago prayed you to grant us permission to build this road; and such is the anxiety to have it, I assure your majesty we could build it in two days, with your royal assent." "*Ebbene!*" exclaimed the old king; "build the road in two days, and you shall be rewarded." He supposed it impossible. The decree went forth; the inhabitants of Nice, of all ranks, rushed with shouts to the work; the peasants flocked down from the neighboring mountains; even priests, women, and children, flew to the spade and the pick-axe; and in a few hours, the cliffs along the sea were swarming with workmen. In two days the road was made, and the king passed over it. It was afterwards Macadamized, and it is now one of the most substantial, and probably the most beautiful road in the world. But Austria interfered; and, at the demand of Metternich, the poor governor of Nice was sacrificed to Austrian vengeance.

2d. The policy of Austria is to discourage all new inventions and movements, particularly anything connected with steam. It is said that the hoary Metternich once declared, that "a steam cotton-factory is bad enough, away in a secluded valley of Hungary; but to see one of those democratic, heretic monsters, within the limits of Austrian proper, he swore by Virgins and Holy Alliances, it should never be." But even Metternich has found steam too strong for him.

3d. Austria has always felt some jealousy of the present king of Sardinia. Those who are acquainted with the policy of His Majesty of Sardinia, might think there was nothing very alarming in his tendency to liberalism; and yet he is really inclined to be liberal. He would be more so, if it were not that Austria holds the sword in *terrorem* over his head. Particularly within the past few years, the Sardinian States have been advancing rapidly, (I use the word in an *Italian* acceptation, and not in our electro-magnetic, chain-lightning sense.) Genoa has received a new start. The importation of cotton has increased from 9,000 bales in 1838, to 50,000 in 1846. With so many appearances of advancement and prosperity, the court of Vienna has regarded this new movement of the railway from the Mediterranean to the Alps, with great jealousy.

4th. Another reason, which has probably had still more weight, is, that the building of this road will injure Trieste most directly. That seaport, whose importance has been so sensibly magnified, by the immense increase of American and English commerce, within the past ten years, (as appeared in an able article in the Magazine, published in 1844, Vol. X,) will receive a heavy blow by the opening of this road. English and American vessels will no longer make the long and hazardous voyage around the peninsula, when inland transportation can deliver those cargoes intended for the interior of Lombardy, and other Austrian provinces, with a saving of time, risk, and expense. Already a large number of cargoes designed for the Austrian States, have arrived at Genoa. Indeed, the cotton and tobacco intended for Milan, which once went round to Trieste, now stops at Genoa, and is sent across the mountains in carts drawn by

long trains of mules, and heavy Swiss horses. A saving can even be effected by horse-carriage. But when this journey can be made in six hours, and at a saving of 80 per cent in expense, the change will be immense.

Besides, the increase in the manufacture of raw cotton throughout Switzerland, Sardinia, and the Germanic States, is incredible. Already the States which constitute the Zoll-Verein, from being the great customers of England, have turned to be her formidable rivals; and English manufactured goods, after being almost excluded from that part of the world, are at last being driven out of Italy. All through the peninsula, the cotton and woollen goods of Prussia and Germany, Austria and Switzerland, are finding their way; and not many years will pass by, before England will entirely lose the continental markets. English statesmen were warned of this by Dr. Bowering, and other advocates of free trade. As long ago as 1835, the Commissioners of the Zoll-Verein proposed some great commercial arrangement by which their productions should be admitted into England at reduced duties, with a reciprocal advantage of a corresponding reduction on the tariffs upon English goods. These considerations were enforced upon English ministers, by all the eloquence and indubitable statistics of Bowering, without avail. He told them that without some relaxation in the blind and suicidal policy of the British tariff, England would drive the Germans into rivalry. In less than ten years his words were proved true, and the Germanic States are now bristling with steam-engines, and all their green valleys are ringing to the clear music of artificial waterfalls. So much for the policy of protection, applied to a single case. Sir Robert Peel discovered this fatal mistake; but, as he himself declared, too late to correct it: the evil was wrought; the acts of the whig ministry could not be recalled!

At this formidable crisis the king gave his assent to the Genoa and Alps railroad, and the work has begun with considerable vigor. The great tunnel, which enters the mountain that overcharges Genoa on the North, will come out on the level plains of Piedmont; after which, no obstacle will be encountered till 130 miles bring the road to the Alps. This tunnel is a stupendous undertaking; it will be, by far, the longest in the world. The king, who has taken 80,000,000 francs of the stock, clearly perceives that his interests are deeply concerned in the rapid completion of this great enterprise, and he is determined it shall not be delayed.

This is, immeasurably, the most important of all the projected railways of Italy; its stock will probably prove the most valuable, and I presume it will be one of the first of the great lines completed.

A foreigner, unacquainted with the commercial state of this country and of the Mediterranean, would not at once perceive the consequences of the completion of this road. It is estimated that by it the commerce of Genoa will, at least, be quadrupled; and this is probably no extravagant estimate. Genoa must then become the port of entry and re-shipment for a great portion of the cotton, tobacco, hides, machinery, and manufactured goods consumed in Lombardy, Switzerland, and several of the German provinces. America is thus directly interested in this movement. Already, in advance, a company of capitalists has been formed in Genoa, for the purchase of cotton in America; it is shipped to Genoa, and then sent through Piedmont *in transitu*, unto the central parts of Europe. In driving this competition with the merchants of Trieste, who are aided

by Rothschilds' agent with all the money they need, they have made handsome speculations; and cotton has, during the last twelve months, held higher prices in this market than in almost any part of Europe. A few days ago I sold a cargo of damaged cotton, at the consulate, for an unprecedentedly high price. This was owing to Lombard and Genoese competition in the sale. When this road is completed, new facilities will be rendered to the German manufacturers; for every return train of cars will bring back their cotton fabrics, to be scattered along the shores of the Mediterranean.

Another aspect, not less interesting, should be considered. It is already reduced to a certainty, that the long-talked-of enterprise of opening the Isthmus of Suez, is to be effected by England, France, and Egypt. The negotiations are completed, and it is said the work is begun. If the plan be consummated, as is now proposed, it will be attended with immense results—which can hardly be conceived, much less developed in a short article. Constantinople will lose much of its importance; for it will cease to be, in a great measure, the *entrepôt* of India commerce. The passage by the Cape of Good Hope will be less frequented, and Genoa will become still more important, as the *entrepôt* of the commerce of the East to the centre of Europe. It will indeed be a strange spectacle, if we should see Genoa once more restored to her former grandeur. During the middle ages this little city controlled, in a great degree, the commerce of the world. The wealth of Asia, and of the North of Europe, was poured in a golden stream into her voluptuous bosom. She reached a pitch of commercial power and glory, which probably surpassed Palmyra, Thebes, Alexandria, and Tyre. But the discovery of the passage of Good Hope, was her ruin. The commerce of the world was changed. The stream which had for ages poured itself into the City of Palaces, was diverted into other channels, and her ruin was almost as complete as that of the commercial cities of the East, whose columns now moulder on the desert. And now that stream will again flow towards her shores. It will not bring the tide of wealth it once brought, and she will not share it alone, but she will have her part; and, if this great road is the first one completed, her carrying trade will be immense.

It was at first proposed to put the Sardinian army at work on this stupendous undertaking, and 100,000 men could soon have completed it. But there were found to exist two insuperable objections to this politic and worthy design. Apprehensions were entertained lest the disaffection of the army might break out into open mutiny, if the lazy loungers, long accustomed to the indolence of the garrison, were put to work; and it was also feared, that while the soldiers were taken from their posts and concentrated upon a well-known point, the people might rise in rebellion. No enlightened statesman would have felt any such apprehensions, for there is no disposition among the Sardinians to resist the dominion of the king. But Italy has long been the scene of insurrections and popular movements, and all the princes of the peninsula are haunted by the ghosts of rebellion.

Thus one of the most salutary and enlightened measures of our times, was sacrificed to the imbecile fears of a minister; and while 100,000 young men are taken from their families, and trades, and fields, to waste the best seven years of a man's life, (from 18 to 26,) and trained up in ignorance, indolence, and vice, and then abandoned to poverty, laziness,

and crime, unfit for all the occupations of life, and disqualified for all the noble duties of citizenship, another 100,000 must be taken from their pursuits to build this road, and then return, reluctantly, with more corrupt habits than ever, to the monotonous occupations they pursued before. Such are some of the hydra-evils of absolute government in our times; such the curse of an overwhelming standing army, which, in time of peace, is worse than the scourge of a desolating and filthy band of locusts, eating up the substance of the land, and scattering their foul excrement wherever they hover. This great Genoa and Turin road is going on slowly, but it will be completed, probably, in three years. We made an effort to procure for Norris & Co., of Philadelphia, the manufacturing of the engines; and if I had not, at that time, been compelled to go to America, I believe I could have consummated the negotiation. But the influence of the British minister at Turin, obtained the contract for Taylor, of England, and he has already founded a branch of his establishment near Genoa, and been aided by several million francs, by the government of His Majesty.

The *second* line (in importance) of those already in progress, is the road from Trieste and Venice to Milan. Austria, alarmed at the progress of the Sardinian State, has begun to bestir herself, and the great road connecting Milan with the Adriatic, is rapidly going forward.

It will be unnecessary to dwell long upon this line. From what I have already said of the Genoa and Turin road, your readers will perceive the importance of this enterprise. It is, in fact, the only hope for Trieste and the commerce of Austria; and even Metternich is compelled, by the bankers of the Austrian empire, and the interests of its subjects, to favor the introduction of those whistling, foaming, thundering, bellowing, rumbling, and lightning horses, which annihilate space, and eat nothing but fire and water.

The new Pontiff—the great Pio IX.—who has astonished all Europe with his reforms in church and State, and risen like a star of promise on the dark brow of Rome, has proclaimed railroads throughout the Pontifical States, and already four great lines are in progress, diverging from Rome to the four points of the compass. One runs South till it strikes the frontiers of Naples, where it will communicate with the northern railway, coming up from Naples; for in the general movement, the king of the Sicilies is determined not to be outdone by other States, and he will “run a small opposition” to the puffing, blowing, wheezing, rumbling, and bellowing freaks of Mount Vesuvius.

The second Roman line leads from the city to the western coast—to Civita-Vecchia—45 miles. The third strikes off to the eastern coast of the peninsula. The fourth advances towards the North, where it will meet the Tuscan line. A considerable number of smaller roads, most of them side-tracks, are also in progress.

III. The number of roads projected, is *legion*; most of them will probably never be built. The Italians will not even build those already in progress, and most of the stock in the Roman roads, is taken in London. They will, in fact, be Anglo-Italian enterprises. I need not dwell on this point.

I will now briefly speak of the resources on which these railways must depend for support. Very few of them can ever yield a large revenue; but money bears a low interest throughout all these States—and after all that has been said about the ruin of Italy, there is no doubt that if there

was the same spirit of speculation here as in England or America, the only difficulty would be in the exorbitant rise of the stock. There are in Genoa alone, ten private men who could, either of them, build an expensive road, "without feeling it;" but the repetition of revolutions, has made them timid of all speculative investments.

All the roads, except those of Lombardy and Piedmont, must depend principally upon passengers for their support, and the passengers will be chiefly foreigners. It is estimated that there are, annually, 150,000 foreigners in Italy. When these roads are completed, the facilities for travelling will be vastly augmented, and the number of travellers will increase in a corresponding ratio. The Italians will also acquire, for the same reasons, the *habit* of travelling—which is nothing but a habit, and to be acquired like others—and intercourse will greatly increase between different States, and people of the same government. One item of considerable importance, is not overlooked by capitalists. The year of "The Jubilee of the Catholic World" is approaching; it will take place in 1850, which will soon be upon us. So unlimited is the enthusiasm felt throughout Europe for the new Pontiff, it is believed that even if this jubilee were to take place this summer, not less than a million of people would rush into Italy. From a long familiarity with the Italian character, I am inclined to believe that an equal number of Italians, themselves, would flock to Rome on that grand occasion. It will be a matter of no little importance, to have these roads completed by that time.

The number of foreigners in Italy is every year increasing, and will continue to increase in the future. This little peninsula has long been, and always will be, the Mecca of the Scholar, the Artist, and the Christian. The *Scholar* comes to these ancient haunts of empire, where the torch of learning once blazed so brilliantly, to wander over the mouldering columns of "dead empires," and at the tombs of Virgil, Cicero, Tasso, and Dante, renew his enthusiasm for the golden dreams of science. The *Artist* comes to bow in reverence before the shrines of Raphaël and Michel Angelo, and try, with a hand trembling with filial reverence, to trace the inimitable outlines of these divine masters. And the *Christian* feels that there is in all the world no spot so holy, after the hill on which the Son of Man died. When the pilgrim uncovers his white locks under the lofty dome of St. Peter, the first emotion of sublimity and veneration which chills his veins, seems worth more to him than all the other days of his life.

C. E. L.

Genoa, May 25, 1847.

ART. IV.—THE COMMERCE OF THE WEST INDIES.

THE West India Islands, now forming a part of the colonial possessions of Great Britain, from the peculiar value of their staple products, and the enterprise which has been employed in developing their resources, have long constituted a prominent theatre of trade and commerce. With a territory yielding in the greatest abundance the fruits of the tropics, as well as the more solid staples of commercial export, they possess, from their position, surrounded by the navigable waters of the ocean, extraordinary advantages for the prosecution of commercial enterprises, which, as it is probably well known, have been improved to a great extent by our

own country. It is our present design to exhibit the prominent facts connected with the commercial operations of those islands, since there is probably no foreign colony near our own ports, which has been more closely connected with us in commercial enterprises, during the early period of our existence as a nation, than the colonies of the West Indies. Those colonies consist of the islands of Jamaica, Antigua, Barbadoes, Dominica, Grenada, Montserrat, Nevis, St. Christopher, St. Lucia, St. Vincent, Tobago, Tortola, Trinidad, Bahamas, Bermudas, Demarara, Berbice, and Honduras.

We would commence with the island of JAMAICA: and it may be remarked, that this island is about 150 miles long, 55 broad, and contains about 4,000,000 of acres. It is extremely well watered, and the face of the country is varied by ridges of cloud-capped mountains, covered with dense forests, hills crowned with groves of pimento, extensive savannas, or plains, picturesque valleys clothed with tropical vegetation, and watered by numerous rivers, bays, and creeks. Possessing many harbors and shipping-stations, which afford good anchorage, it has numerous settlements which are prominent depots of trade, the most important of which is Kingston. The fertility of the soil is favorable to the production of sugar and coffee, and the fruits are various. Of vegetable productions, the yam and cassava are common, and the products of the garden are here found in almost infinite variety. Some of the fruits are, indeed, in perfection during the entire year. The bread-fruit tree, cocoa-nut, plantain, banana, the alligator pear, the mellow fig, the pine, cashew, pawpaw, and custard apple, the mango, grape, guava, pomegranate, soursop, shaddock, plum, tamarind, chestnut, mulberry, olive, date, citron, and many other fruits, are found in perfection. Extensive groves of the orange, the lemon, and the lime, abound in the island. So, also, does maize, and the sweet potato. It yields, also, an abundance of drugs and spices: aloes, cochineal, spikenard, cunella, liquorice-root, castor-oil-nut, vanilla, peppers, arrow-root, ginger, ipecacuanha, scammony, jalap, cassia, euphorbia, and senna. The principal exports from the colony, however, are sugar, rum, molasses, ginger, pimento, and coffee. The shipping of this island is considerable, the total number of vessels inwards, during the year 1836, being 772, employing a tonnage of 112,075 tons, and 7,170 men; and the amount of shipping outwards, during the same period, was 782 vessels, with a tonnage of 119,066 tons, employing 7,510 men.

A comprehensive article, in *Simmonds' Colonial (London) Magazine*, for March, 1847, furnishes some recent authentic information, of the present and prospective trade of this island; and as it contains statements of interest to the commerce of the United States, we have concluded to give it entire, as follows:—

On reviewing the mercantile events of the past year, we recognise nothing on which to congratulate our commercial friends. The entire twelvemonth was one scene of unexampled commercial distress, induced by circumstances which might, we confess, have been in some degree avoided, and others which it was not in our power to control. An import disproportioned to the wants of the community, was met by almost overwhelming agricultural difficulties. The drought which commenced about the end of 1845, and continued until July last, was productive, as is well known, of injury and loss to the proprietors, to an amount which we cannot even at this moment estimate; and numbers of laborers, whose prosperity depended on that of their masters, were thrown out of employment by the affliction with which it had pleased Providence to visit this island, and the free circulation of money

when out of a job proceed upon the theory stated by a man who told me that he had walked in from Paterson, N. J., to spend three days in New York, even though he meant to go back at the end of that time to another job of work in Paterson, "Because," he said, "in New York you can't quite starve: they don't dare let you." Thus it is that there are 40,000 men in the cheap lodging-houses of the lower East Side, and there are 20,000 others living in cheap "furnished rooms."

Of the half whose stories are true, the stories themselves sometimes tell a tale. When you read between the lines it is easy to discover some special source of difficulty. This may be nothing more or less than laziness; it may be lack of opportunity; it may be base rascality; it may be sheer incompetence; it may be the effect of life under conditions which few who have not lived it can realize. One who has listened for a year to stories from these people has learned many things about some common forms of daily work which create sympathy because of the hardness of these conditions: for example, the case of a cab-driver who contracted pneumonia sitting for twelve hours in the rain; the case of a painter who suffered from blood-poison; the case of a longshoreman (whose work is perhaps the most brutal of all the work that human beings ever do) who had frozen off one foot and both his hands. One thing that I have seen is the horrid condition of loneliness of the life of the average inmate of a so-called "furnished room"; another thing I have learned is the absurdly small amount upon which people actually go on living indefinitely from day to day when out of work; while still another is the sordid condition of life in the city's ten-cent and fifteen-cent lodging-houses. Besides, one is surprised to find the number of people who have lost estates through the villainy of lawyers, the number of people who have furniture in storage, the number of working men in New York who have neither home nor family and the number of people who live from hand to mouth from week to week and never in their lives have had a bank account.

Last of all the things that one learns and that most of all surprises him is the relative number of persons of different nationalities who ask for aid. The revelation in this matter is enough to give those pause who cry so

loud against foreign immigration. For of all those who have come to me by far the largest number were poor, native Americans. Next to these were Irish; next to these were English; next were Germans; and, either last of all or not at all, the members of those very races we have always most decried.

There must, however, be real causes why such people are in such a state, no matter whether what they tell be true or false. Perhaps a few of the more important causes are these: first of all, some do it merely because they like the game; the part they play is an actor's part—the element of conquest and uncertainty being as fascinating to some natures and approaching in the pleasure of it all the joy of gambling. Of the young men who call, some are merely prodigals off on a spree; their stories are true and telegrams sent to their parents will often bring back the reply—"He is mine; send him home." Sometimes again the answer to the same kind of a telegram will read—"Know him, always was a ne'er do-well. Give no more money. Only cure for his state is to let him suffer."

Of course, the thing which most of all has wrought downfall is the use of liquor and, in a surprisingly large number of cases in this same group must be added the victims of opium, morphine, cocaine and other drugs. But last of all is that large class who are nothing more or less than lazy. Of these the most outspoken was an Englishman who came to me and, in his broadest brogue, explained that he wished me to use my influence to get him in an hospital. He had made an application in each one of seven hospitals within the city limits and in each case he had been unable to persuade the doctors that there was anything the matter with him. He looked well and hearty and I asked him what his trouble really was. He explained that he was tired and wanted for a week to lie in bed and to rest.

What shall be done with these people? The clergy confess their perplexity. They realize the pressing need for something to be done, and quickly. The problem is becoming so large they simply cannot cope with it. Perhaps more people have approached them during this last year than upon any year before, and that in the face of the fact that times were never quite so good and there never was so little reason why men should be in distress.

THE HIGHEST OF ALL RAILROADS

THE ENGINEERING PROBLEMS OF THE OROYA RAILROAD OF PERU

BY

E. C. ROST

Illustrated from photographs taken by the author

TO leave the hot tropics, eight degrees south of the Equator, at eight o'clock in the morning and arrive up among perpetual snow and glaciers at four o'clock in the afternoon of the same day, is a feat that can be accomplished only on the Oroya Railroad in Peru, known as the Ferro Carril Central del Peru, without doubt the most wonderful railroad ever constructed. It was built by Americans, Messrs. Meigs and Thorndike. The total length of the line from Callao to Oroya is one hundred and thirty-eight miles and the cost was forty-three millions of dollars (\$43,000,000). In the morning you wear the thinnest of linen, in the early afternoon you shiver in the heaviest of overcoats. Passenger trains leave but twice a week each way. We steamed slowly out of the Lima depot at eight o'clock in the morning. Our train consisted of four cars, built and patterned after the cars in use on our great trunk lines, and was drawn by an American locomotive.

At Chosica, thirty-three miles from Lima and two thousand feet altitude, we come to the first V—a switch system introduced on this line. The locomotive draws the cars over one section, then runs on to a V-switch and pushes the cars over the next section. The entire road to the summit being a four-per-cent. grade, the great elevation is gained in this manner without traveling round and round the mountains to make the ascent. This zig-zag switch-back system is used over the entire line. We pass a few unimportant stations and arrive at San Bartolome, forty-seven miles away and of four thousand nine hundred and fifty-nine feet altitude; here are several side-tracks permitting trains to pass each other. Four miles from here we cross the famous Verrugas bridge, in itself one of the greatest of railroad bridges, and built in Philadelphia.

Skirting a precipice where we see the Rio Remac thousands of feet below us, we stop at Matucana. The walls of the Andes tower up far

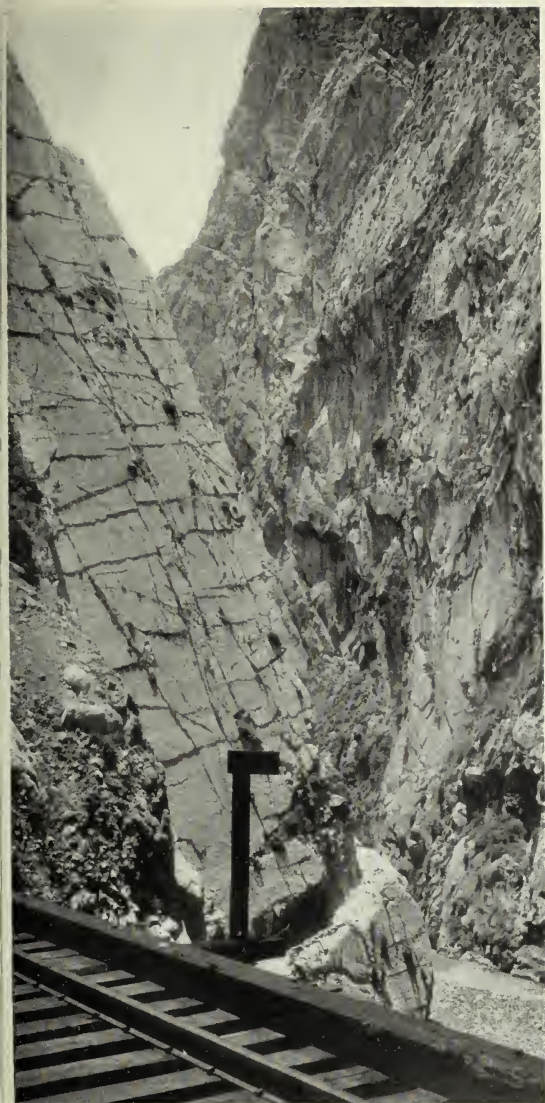
above the clouds, and between them there cuts a ravine or a bottomless abyss. How man ever surveyed such a road seems beyond solution. In some places on these all but perpendicular walls there is no foothold for even an animal. Here the surveyors were slung over the cliffs and held suspended by a rope from above, with a rocky floor thousands of feet below them. It has been said that Vesuvius, if it were dropped into some of the crevices here, would be practically lost to view.

The engineering problems accomplished are amazing. In one section the road-bed was once the bottom of the raging torrents of the Remac before a tunnel was constructed permitting these volumes of water to pass below.

After passing San Mateo, a modern American-built steel bridge spans the torrents of the river Remac, the bridge spans suspended from the opposite mouths of two tunnels. A little farther on is a narrow pass with such huge walls towering above us on either side that the sky is shut out, giving an effect similar to that within a tunnel, when the entrance becomes smaller, and finally cannot be seen.

Toward the summit we look up toward white snow and green glaciers, then—although we are near the Equator—all is hidden by a sudden snow-squall which in a few moments passes over us. A sudden turn in the road reveals the entrance to the Galera tunnel. Half way through this one and one-half mile tunnel we pass the place where the acme of railroading has been reached, fifteen thousand six hundred and sixty-five feet in a perpendicular line above the level of the sea or one thousand four hundred and forty-five feet higher than the summit of Pike's Peak in Colorado, on a level with the Summit of Mont Blanc in Switzerland.

The real interest centres, however, in the return trip, if one is so fortunate as to fall into the good graces of the superintendent—and he is a most hospitable person who, in my case, not only sent the American road-master with



THE HUGE WALLS TOWERING ABOVE ON EITHER SIDE"

me but also furnished me with a "hand-car" which from Galera tunnel runs by its own momentum to the Pacific shores; this gave us the opportunity of stopping whenever we chose to make photographs. We left the Atlantic side of the tunnel in a blinding snow-storm, our car being pushed by an Indian to the centre of the tunnel where the descent begins. From here we rushed through darkness and soon found ourselves at the Pacific entrance of the tunnel and the weather conditions entirely changed. Here was a bright sun, crisp air and an azure sky above. We were soon overtaken, however, by several snow-

squalls and for that reason I later on made a second trip. Then it was that I enjoyed the most remarkable experience I ever had, our car making in some places easily sixty miles an hour.

One can coast from the tunnel one hundred and six miles to sea level, dashing at lightning speed through dark tunnels, over a bridge, then around curves so sharp that only a few feet ahead are seen at one time, then skirting the precipice at the foot of which dash mad torrents, the scenery dashing by as if enveloped in a fog. A stone may have lodged on the road-bed, a goat or llama may be strolling there. and should your little car strike



IN THE HEART OF THE ANDES
One of the many tunnels may be seen at the left



WITHIN THE MOUNTAINS

Looking out from one tunnel into the open, and through a tunnel beyond into the farther open air

such an obstruction it must be derailed and perchance rolled down some abyss.

From Oroya, the Eastern terminal of the road, one continues his travels on mule-back, the only method of transportation. Some eighty miles from here and some four thousand feet higher up in the world are the famous Cerro de Pasco mines, the highest mining establishment on the globe, and where are the very headwaters of the mighty Amazon. Concessions have been granted to continue the railroad from Oroya to the Pasco regions and surveys have been made.

The object in building the Oroya road was to carry the traffic from the eastern slopes of the Andes to the sea coasts, as well as immense quantities of various ores from different points along the line. The road is of regulation broad gauge and from the sea coast to the summit an even four-per-cent. grade; the fuel used is petroleum.

Certainly the Oroya Railroad is a moving panorama of the combined wonders of nature and remarkable engineering.



WHERE THE RAILROAD RACES WITH THE RIVER REMAC

(London) World's Work
Jan. 1914

THE RAILWAYS' FIGHT FOR EXISTENCE

WHAT WILL THE ROYAL COMMISSION REVEAL?—INFLUENCE OF LABOUR UPON FREIGHT RATES—POOLING INSTEAD OF FIGHTING—GRADES AND THEIR INFLUENCE UPON TRANSPORTATION CHARGES—OVERHAULING THE WORLD'S RAILWAYS—REVIVING AN OLD IDEA—HAS ELECTRICITY FAILED?—SEARCH FOR A NEW LOCOMOTIVE—WHAT THE SHAREHOLDERS

GET

BY FREDERICK A. TALBOT

IT was not surprising that the appointment of a Commission for the investigation of the ways and means of the working of our railways should be hailed with enthusiasm by those to whom private ownership is anathema. The coming of nationalisation was their immediate interpretation of the event. Their exuberant satisfaction brought about the usual stampede among investors, though in a somewhat milder form than had been anticipated, and the Stock Exchange soon recovered its equilibrium.

But the advocates of nationalisation were not alone in welcoming the announcement. There is another group, whose unostentatious work is the object of malign attack, and who never can do anything right. This party is composed of those who have to keep the railways of the world going; who have to struggle to hold their respective enterprises above water; and who leave no stone unturned to keep the profit and loss account so balanced that the investor receives something tangible for the use of his money.

A little while ago two railway magnates who are known the whole world over chanced to meet at their club. Both are railway organisers; both toil prodigiously to justify the confidence of employees and shareholders; and both as a rule work sixteen hours a day. It was but natural that they should talk over matters which concerned their welfare so vitally.

"How do you find things?" asked A——.

"Just about as much as I can manage," retorted B——. "By paring here and trimming there it is just possible to main-

tain the appearance of booming prosperity. And you?"

"A pretty stiff struggle to keep above water. It is merely a question of scraping throughout the twenty-four hours in order to get any net revenue at all."

And this is the undoubted state of affairs throughout the railway world of to-day. On all sides improvements are being kept down; new construction is reduced to the minimum—in fact little but a mark-time attitude is being maintained. The railway governing forces to whom the investor looks for an adequate return upon his capital is being too heavily assailed to run any risks. On the one hand labour is insisting that it should receive higher wages, and as an inevitable corollary the cost of raw materials for the railways' needs is upon the increase. On the other hand, shippers and the public are fighting to secure cheaper transportation.

Between these two conflicting forces the railway is in danger of falling to the ground. At the present moment the railway director, while admitting that the demands of labour should receive due acknowledgment, maintains that this cannot be done without increasing rates, but when this proposal for satisfying the workmen is raised the opposition of the trading community is revealed in no uncertain manner, and probably, taken all round, is a far more powerful antagonist to fear than the unions.

For this reason the railway operating departments are rather amicably disposed towards the Commission. For the first time they will be able to present their side of the case in a graphic straightforward manner: will be able to de-

monstrate the anomalies under which they suffer: will be able to set out their recommendations for adjusting the situation, which, being the fruits of practical experience, are certain to demand the closest attention and respect.

Nationalisation no Panacea

Then, possibly, it will be shown that such a drastic step as nationalisation is not going to be the panacea for all ills attending railway transportation. The State could no more afford to run the railways of the country at a loss than can private enterprise, while it must not be overlooked that officialdom, being part and parcel of any government undertaking, the cost of running the roads is certain to rise, and the shipper will be called upon to make good the deficiency.

At the present moment a titanic struggle occupies the railways of the world in the fight for traffic. This struggle has assumed a new aspect during the past two decades. In the early days competition took the form of rate wars, physical and legal opposition, indiscriminate running of trains, conflicting lines, and foolhardy attempts to divide traffic which in itself was inadequate to support one road. Such a condition of things was unavoidable.

Financiers sought the control of this and that line, dreamed big dreams of monopolistic systems, made the roads they had acquired the sport of bulls and bears, squeezed a line until it could not yield another penny and then threw it away, in fact spared no effort to secure a victory over a rival. When the railway magnates fell out the masses came into their own. Freight was handled at absurdly low rates merely to bulk the ton-miles, while passengers were carried for fares equally low to prevent trains travelling to and fro empty. In the United States this peculiar warfare was waged upon a huge scale for many years, and at times it became possible to make the journey between the Atlantic and the Pacific for an outlay of a few shillings instead of pounds.

What Pooling is Doing

But those strenuous days have disappeared for ever. Inter-competition has

given way to pooling, so that rates can be maintained; train services superfluous and unremunerative are eliminated; and the train-miles have been reduced to the minimum. At competitive points, where formerly remarkable activity prevailed, stations have been closed, staffs decreased, and in many instances miles of line practically abandoned. In this manner far-reaching economies have been effected.

Pooling of traffic is the logical retort to the aggressive assaults of labour and traders. It is tending to weld together the whole network of steel in any country. So far as Great Britain is concerned its railways are in a condition similar to that which would prevail were nationalisation in operation. There is no sign of any keen competition for business. In a town or city served, say, by three roads one will observe that traffic is collected and delivered by the vans of either line. If goods are to be shipped or a passenger seeks a ticket they do not fall over one another in the effort to secure the business. It is immaterial by which road the traffic is dispatched for the simple reason that the revenue is divided between them. By following this practice the three companies are able to provide the centre in question with just sufficient train services for its necessities. Not a single train nor a goods waggon more than is requisite is run.

Concurrently with this modern method of working the railway a further development may be noted. Countries are becoming divided into spheres of activity, so that a railway is enabled to exploit what it regards as its own preserves in peace and quietness, and without having its security imperilled by the invasion of a competing line. This arrangement may, or may not, react detrimentally upon the community living in the particular town or city, but the latter has no redress. The residents and commercial interests may deplore the absence of a competing road, and argue that if they were provided with such they would be certain to derive benefits, but experience would speedily reveal the fact that in such a case the benefits would be more imaginary than real.

Struggle to Reduce Costs

Despite this modern development of railway working, however, it must be not be concluded that the railways are inactive. Far from it. Other issues of greater significance have arisen, which are taxing the abilities of the respective governing forces far more acutely. This is the reduction of the cost of transporting both passenger and freight. It affects the last named most particularly because it constitutes the bulk of a railway's revenue. In railway parlance the problem is "How to reduce the train-miles, and increase the ton-miles as well as augmenting the profit per ton-mile?"

In facing this proposition the railways are confronted with severe limitations. There is the gauge of the track as well as the gauge of bridges and tunnels to be taken into consideration, while grades and curvature also influence the situation very appreciably. The first two are practically unalterable: the last-named are capable of adjustment with a reasonable outlay, although the expenditure of millions may be entailed. Improvements in this latter connection affect matters of maintenance charges both of track and stock, so that the cutting out of a hill or the straightening of a kink, while expensive, may show sufficient saving in wear and tear to defray a goodly proportion of the interest upon the capital expenditure.

It will be remembered, when Harriman started his colossal campaign of railway aggrandisement, that he spoke seriously of changing the gauge of the roads brought under his control. For once the astute railway financier ventured an opinion before he had taken technical counsel. When his engineers, who were told to prepare estimates upon the scheme without delay, submitted their report, the man of millions was staggered.

He had regarded the situation merely from his own point of view. He recognised that it meant the reconstruction of the whole of the roads he had secured, but he overlooked the fact that if a conversion were effected he would become isolated. Interchange of traffic would become impossible, and, consequently, nothing but local business ever would

be possible. Converting his system to the broad gauge was a very simple matter, but it did not stop at that. All the railways upon the North American continent, from Mexico to Canada, would have to be transformed, and as no other railway was prepared to undertake such a revolutionary enterprise, the cost of which would be fabulous, the change of gauge project was dropped like a hot coal.

Rebuilding a Transcontinental

Determined to secure improved financial returns from the operation of his lines by hook or by crook, Harriman conceived another equally startling project. The Union and Central Pacific system had been built in a hurry, and consequently was not only indifferently laid but was a maze of twists and turns, and ran up and down like a gigantic switch-back. He would straighten the bends and flatten the grades. This involved virtual reconstruction, and here again, although he was warned that millions would be necessary to complete his scheme, he merely told the engineers to "Go ahead!"

The "first transcontinental" was pulled to pieces from end to end. It was a patchwork job, and although apparently straightforward it bristled with peculiar difficulties.

In order to overcome Sherman Hill a stable of big locomotives had to be maintained at the bottom of the hump and were drawn out in threes, fours, and even fives, to give a passing train the necessary boost over the bank. That stable of pushers was to be wiped out at all hazards. The summit level was lowered, and overcome by a long tunnel. Lofty embankments were piled up and deep cuttings dug to maintain the level straight line which he demanded.

Then he eliminated the wide and difficult détour around the north end of Salt Lake, by cutting straight across this inland sea with a trestle and earthen embankment which alone cost over £1,000,000. Wherever an improvement between Salt Lake and the Pacific Coast was possible and remunerative he did not hesitate to sanction it, even if the reconstruction was only a matter of two or three hundred yards

By the time he had straightened out the first transcontinental across North America he had clipped off some 300 miles or so in distance, had pulled down climbs by hundreds of feet, and had spent well over £10,000,000. So satisfied was he with this achievement and its results that he proposed to overcome the most serious handicap to his railway—the tedious crawl over the Sierras. He proposed to tunnel the range, although it involved a work comparable with that of the sub-Alpine tubes. But this last bold project became shelved upon his death, and although it has been resuscitated upon one or two occasions since, there is a pardonable hesitancy upon the part of the financial element to back the engineers in such a task.

The Victims of Grades

Another railroad which has undergone considerable overhaul is the Pennsylvania system. When railways were first built upon the American continent the engineers apparently endeavoured to create their own standard of construction, and accordingly never paused to contemplate the enormous locomotive effort that would be required to get over the grades. On the other hand, when the first British roads were laid the engineers aimed at as straight and as level a line as possible. This was due to the general belief that a locomotive would be unable to ascend a bank stiffer than one in about three hundred by adhesion. It was fortunate for the present generation that such a theory prevailed because it has saved many millions in overhaul.

Consequently, on the Pennsylvania system, grades of one in thirty-three were not uncommon, especially among the mountains. Later knowledge recognising the brake such climbs imposed upon cheap movement decided upon their removal, together with an improved standard of permanent way, the latter indeed being based upon the best British practice. Re-alignment was practised freely among the mountains, and in this manner it was possible to reduce the maximum gradient upon the trunk road to one in fifty-seven. By such work not only were double and triple heading abolished in connection

with the passenger expresses, but it became possible to increase freight loads per train under one locomotive from 400 to 600 per cent.

The Canadian Pacific, having been built according to the constructional standards which prevailed when the first American transcontinental was constructed, has some very severe pulls against the collar upon its mountain reaches, where the grades run up to 105 feet per mile. When it was in sole possession of the territory served, the existence of such banks, and especially that of 237½ feet per mile between Hector and Field, did not affect the issue very vitally, although in the last named instance, four and five engines had to be attached to a train to lift it over the ever-rising hump.

But when its supremacy was challenged by the Grand Trunk Pacific with its maximum grade of twenty-one feet per mile between the two oceans, and by the Canadian Northern which laid down a rise of 52.8 feet per mile as its maximum, overhauling had to be undertaken boldly and without delay. The first step was the abolition of the "Big Hill" at a cost of £250,000, and this is being followed by the driving of a five-mile tunnel through the base of the Selkirks, instead of toiling over their ragged crests, which work will entail an expenditure of some £2,000,000.

Overhauling the World's Railways

In Mexico also extensive overhauling has been carried out to bring about a reduction in train-miles and an increased ton-mileage. Many of the grades upon the lines, owing to the mountainous character of the country, were so steep as to demand the utilisation of special locomotives such as the Fairlie duplex. On the English-owned Mexican railway the growth of traffic and threatened filching of business by the national system driving a competitive line to the Atlantic coastal ports, the supply of more powerful engines became imperative for mountain service, and to-day these rank as the largest and most powerful Fairlie engines in service. So far as the national system is concerned it has been spending millions freely in the struggle to bring

its roads into line with American standards, to enable the mammoth Mallet articulated freight locomotives, which have been introduced, to haul trains three and four times the length of what formerly was possible.

While overhauling and rebuilding perhaps are most powerfully expressed upon the North American continent in the struggle to make ends meet, it is by no means confined thereto. Several European countries are engaged in a similar struggle. Possibly there is no country where railway traffic assumes such a peculiar interest as in Switzerland. Local business is a trifling contribution to the railway finances of the state. It is the through transport of the produce of other countries which has to be watched and nursed.

When the Gothard tunnel was completed it gave a new highway between the North Sea and the Adriatic, and offered spirited competition to the business flowing by way of the Cenis tunnel. But to-day the Gothard route is the most exacting and expensive to operate of all the through steel highways in the country, owing to the heavy grades and sharp curves which are encountered between Goschenen and Biasca. Double heading is practised, powerful locomotives expressly designed for the mountain section being employed to work the train over the famous Pass and through the tunnel. On the Simplon and Loetschberg electric working has been adopted with highly favourable results from the financial point of view, and so soon as practicable, the Gothard route will be adapted to this form of traction.

Reviving an Old Idea

The completion of the Cenis tunnel gave the French an entry into Italy, but here again the grades have proved a severe stumbling-block to economical working. To-day the Cenis tunnel and its line is the limit of the route's capacity. When this particular work was under way the necessity arose of accelerating the overland Brindisi mails, which were transported by coaches and other primitive facilities across the Alps.

An English engineer, named Fell, per-

fecting a new mountain railway system the feature of which was a third rail, laid mid-way between the ordinary carrying rails, and with which horizontal wheels, mounted upon the locomotive, engaged. This system was born before the modern rack rail, and was designed for service upon banks ranging from 1 in 17½ to that capable of operation by ordinary adhesion. The line was laid over the Cenis Pass, and fulfilled its work with perfect success, but, according to the terms of the concession, had to be removed directly the Cenis tunnel was completed, as a rival to the costly tunnel was not entertained favourably by either of the parties who had financed the latter enterprise.

For years little has been heard of the Fell centre rail system, although its virtues always have been appreciated by engineers. But now that the Alpine tunnelling fever has died down owing to the cost of such works and the slender possibility of their showing adequate profit from operation, the Fell system has been revived. At the moment a new trans-Alpine route is being discussed, and it is proposed to go over instead of through the mountains by the Fell railway, selecting a favourable Pass and laying down a first-class trunk road for the engines of this type.

Not only is such a railway immeasurably cheaper than tunnelling, but it is easier to maintain, and there is not such a heavy strain upon the railway in the defraying of the interest upon the capital outlay. At either end of the third-rail system locomotives must be changed, but this operation is not provocative of any more delay than is experienced at either end of the Simplon line, where the change from electric to steam traction is effected. Another advantage is the possibility of being able to pass more traffic over a surface than through a subterranean line. Travelling speeds are about the same, but, even if the Fell line does involve comparative deceleration, which it does not, there is compensating advantage of lower working costs.

Some years ago, when the American railway magnates were at close grips, and were striving might and main to secure an advantage, no matter how

trivial, over one another, electric operation was held to be the one means whereby the difference between profit and loss in working might be widened to the advantage of the former. A mild boom set in and in due course spread to Europe. But the electrification of the trunk roads of the world has not made very distinctive progress.

The wholesale conversion which it was stated was about to take place has failed to mature. Electrification has been confined almost exclusively to long tunnels and congested suburban traffic. For long-distance business steam still reigns supreme, and the present trend of opinion is that it will not be displaced, at least not by electricity, for many years to come—if ever. Moreover, the majority of the lines have just as much as they can bear at the present moment in the way of financial strain, and evince no desire to inflate their capitalisation account any further by embracing electric traction. Many ambitious schemes have been drawn up, but there is no indication of their proceeding beyond the paper stage.

Search for a New Locomotive

In many quarters it is maintained that the true solution of this perplexing issue lies not in electricity, but in some other form of self-contained tractive unit. Interesting experiments of a varied character are being made in this field. During the past two or three years many interesting departures from orthodox locomotive practice have been made experimentally.

There was the turbo-locomotive which indicated a possible phase of development. This year the Diesel locomotive has made its appearance and is being tested in Switzerland, but so far this ingenious effort has not been received with very marked enthusiasm, inasmuch as there are several problems, incidental to the system, which remain to be solved.

During the next few months an internal combustion locomotive is due to emerge from an English locomotive constructional house, and its arrival is being awaited with keen anticipation, because in the event of success it possesses illimitable possibilities for application where vast

reaches of unproductive country have to be traversed and where fuel is necessarily somewhat costly.

The investigations of the commission are certain to be productive of beneficial results. Abstruse problems in connection with railway working will be unravelled and the public, which is somewhat mystified by the ways and means of our railways, will realise that there is nothing mysterious whatever. The complexity of freight rates will be simplified so as to be comprehensible, and the British farmer will learn why perishable articles grown in the South of France can be dumped into Covent Garden at a less rate than home-grown produce. There was never a trader yet who did not quarrel with freight rates; even if his goods were carried free he would still find a cause for complaint.

Unfortunately it has become the practice of the community, not only of these islands, but of every other country, to assail the railways. But is this attitude justifiable? With the exception of a few systems the shareholder receives less return upon his money than if he had invested it in Consols, and the value of his security shows quite as pronounced a shrinkage. Undoubtedly there are considerable dead timber and watered stocks in the capital of every system. If this were cut away—the speculative fever having expended itself so far as railways are concerned—enormous economies might be effected, but at the same time the theory that “rates should be decreased coincidentally with an increase in the cost of operation” is opposed to all the ethics of rational commerce.

In the United States, according to the latest compiled statistics, the average return upon the capital invested in railways is only $3\frac{1}{2}$ per cent., and it is a moot point whether the return in these islands from the same class of investment is any higher. The expense of running our railways has increased by leaps and bounds during the past twenty years. On some roads, out of every £1 earned no less than 14s. have to be disbursed in the form of working expenses, so that, contrary to the general opinion, the shareholder does not appropriate the lion's share of a railway's revenue.



THE GREAT "CUT-OFF" ON SALT LAKE, UTAH
Where Harriman spent £1,000,000 to save mileage on the Union Pacific



COSTLY RAILWAY OPERATION—A CLIMB OF TWO MILES ABOVE SEA LEVEL
The Denver and Rio Grande, in order to overcome the Rockies, has to climb Marshall Pass, the great continental divide



A LANCASHIRE-BUILT " FAIRLIE LOCO " FOR HEAVY GRADES ON THE MEXICAN RAILWAY



TO-DAY AND YESTERDAY—A SANTA FÉ RAILWAY TRAIN



THE FAMOUS HORSESHOE CURVE

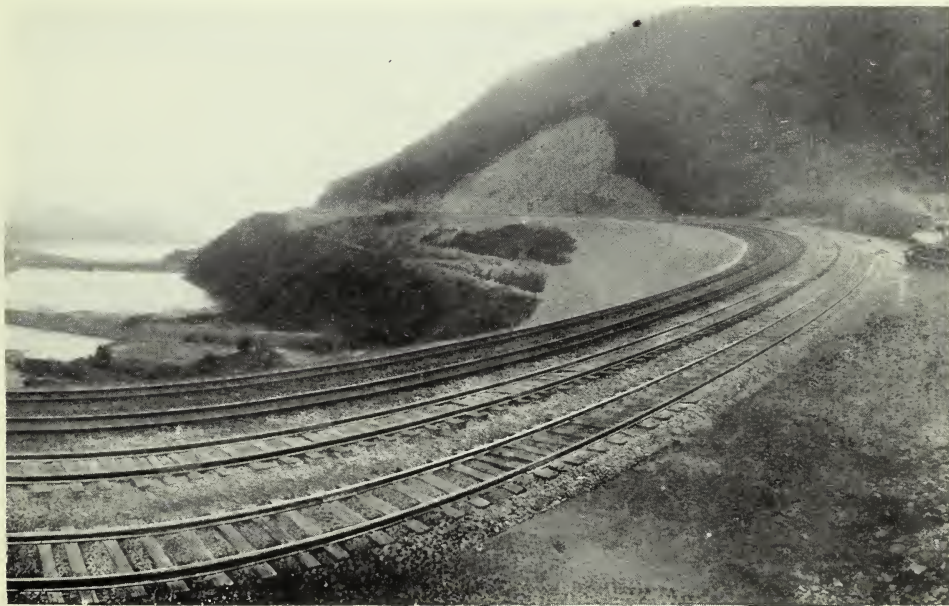
THE RAILWAYS' FIGHT FOR EXISTENCE



A SPEED TEST BETWEEN A STEAM AND AN ELECTRICAL LOCOMOTIVE



OF TWENTY-FIVE YEARS AGO LED BY ONE OF TO-DAY



ON THE PENNSYLVANIA RAILWAY



A TEMPORARY SWITCHBACK LINE

Built at a cost of £100,000, while the Cascade Tunnel was being built



COSTLY CONSTRUCTION

A series of tunnels on the Moffat Line in the Rockies



BUILDING A NEW SNOW-SHED ON THE GREAT NORTHERN RAILWAY

Half a mile of this construction in ferro-concrete costs £100,000

THE VICTORIA RAILWAY BRIDGE AT MONTREAL.

This stupendous enterprise, as we learn from the *State of Maine*, is now in active progress, and unless unforeseen circumstances should occur, it is intended that the first train of the Grand Trunk Railway Company shall go through the Victoria Bridge in the summer of 1858.

For the following description of what has been not inappropriately designated the greatest work of modern times, we are indebted to JOHN A. POOR, Esq., the editor of the *State of Maine*, and one of the earliest and most efficient agents in bringing about the "annexation" of Canada to the United States by means of the Atlantic and St. Lawrence Railroad. This account was prepared by Sir C. P. ROONEY, from data furnished by Mr. A. M. ROSS, Chief Engineer of this great work, and may be relied upon as entirely accurate in all its details:—

As is already well known, the commercial reason given for the construction of the Victoria Bridge, is the necessity of bringing in the exhaustless products of Canada West, and of the Western States of the Union—such as Michigan, Illinois, Iowa, Wisconsin, Minnesota, &c.—without break of gauge or of bulk, from the extreme Western point of British North America to the Atlantic seaboard. The promoters of the undertaking allege that, by means of the bridge, they will be able to meet the requirements of this traffic more cheaply and expeditiously than by any other existing route, whether of rail or of water; and they must be doubtless strong in the faith, as its cost is to be about seven millions of dollars, or about one-seventh of the total expense of building the 1,112 miles comprising the Grand Trunk Railway of Canada.

The bridge is to be tubular, on the plan of the celebrated Britannia Bridge over the Menai Straits, in North Wales. It will consist of 25 spans or spaces for navigation between the 24 piers, (exclusive of two abutments,) for the support of the tubes. The center span will be 330 feet wide, and each of the other spans will be 242 feet wide. The width of each of the piers next to the abutments will be 15 feet, and the width of those approaching the two center piers will be gradually increased, so that these two piers will each be 18 feet wide, or 3 feet more than those next the abutments. Each abutment is to be 242 feet long and 90 feet wide, and from the north shore of the St. Lawrence to the north abutment there will be a solid stone embankment, (faced in rough masonry towards the current,) 1,200 feet in length. The stone embankment leading from the south shore of the river to the south abutment, will be 600 feet long. The length of the bridge, from abutment to abutment, will be 8,000 feet, and its total length from river bank to river bank will be 10,284 feet, or 176 feet less than two English miles.

The clear distance between the ordinary summer level of the St. Lawrence and the under surface of the center tube is to be 60 feet, and the height diminishes towards either side, with a grade at the rate of 1 in 130, or 40 feet in the mile, so that at the outer or river edge of each abutment the height is 36 feet above the summer level. The summer depth of the water in the St. Lawrence varies from 14 feet about the center to 4 feet towards the banks, and the current runs, at the site of the bridge, at a rate varying from 7 to 10 miles an hour.

Each of the tubes will be 19 feet in height at the end, whence they will gradually increase to 22 feet 6 inches in the center. The width of each tube will be 16 feet, or 9 feet 6 inches wider than the rail track. The total weight of iron in the tubes will be 10,400 tons, and they will be bound and riveted together precisely in the same manner and with similar machinery to that employed in the Britannia Bridge. The principal part of the stone used in the construction of the piers and abutments is a dense, blue limestone, found at Pointe Claire, on the Ottawa River, about 18 miles above Montreal, about 8 above the confluence of that river with the St. Lawrence. A large village has suddenly sprung up at the place, for during the last twelve months upwards of 500 quarrymen, stone-masons, and laborers have been employed there. Every contrivance that could be adopted to save manual labor has also been applied, and its extent will be judged from the fact that the machinery at the quarry and the adjacent jetty has—including the cost of the jetty—involved an outlay of \$150,000. Three powerful steam-tugs and 35 barges, each capable of carrying 200 tons of stone, have been specially built for the work, at a cost of about \$120,000. These are used

for the conveyance of the stone to the piers; and by the end of September next, a railway on the permanent line of the Grand Trunk track will be laid down from the quarry—close to which the permanent line will pass—to the north shore of the St. Lawrence, so as to convey along it the stone required for the north embankment and for the northern abutment.

The piers close to the abutments will each contain about 6,000 tons of masonry. Scarcely a block used in the construction of the piers will be less than 7 tons weight, and many of them, especially those exposed to the force of the current and to the breaking up of ice in spring, will weigh fully 10 tons each. As the construction of "Pier No. 1" is already several feet above the bed of the river, the process of binding the blocks together can now be seen and appreciated. In addition to the abundant use of the best water cement, each stone is clamped to its neighbors in several places by iron rivets, and the interstices between the rivets and the blocks are filled up with molten lead. If the mighty St. Lawrence conquers these combined appliances, then indeed is there an end to all mechanical resistances.

In consequence of the increased height and width of the piers converging towards the center, the weight of stone in those that will bear the center tube will be about 8,000 tons each. The total amount of masonry in the piers will be 27,500,000 cubic feet, which, at $13\frac{1}{2}$ feet to the ton, gives a total weight of about 205,000 tons.

Mr. Robert Stephenson and Mr. A. M. Ross are the engineers of the bridge, on behalf of the Grand Trunk Railway. The former gentleman visited Canada last year, and purposes returning again when the works have made further progress. The latter is permanently located in the province, not only for the superintendence of the bridge, but also as Engineer-in-chief of the railway company. The contractors are Messrs. Peto, Brassey, Betts & Jackson, and their representative in Canada for the Victoria Bridge, and for the railway from Montreal to Kingston, a distance of 180 miles, is Mr. James Hodges, a gentleman well known in connection with some of the most important engineering works in England.

The coffer dams, (entirely on a new principle invented by Mr. Hodges,) for the northern abutment and the three first adjacent piers, have been some time successfully placed. The masonry in Pier No. 1, as has already been stated, is several feet above the bed of the St. Lawrence. It is commenced in the next pier, and is ready for a beginning in the abutment. The whole of these will be raised ten feet above the winter level of the St. Lawrence, which is 17 feet above the summer level, before the ice sets in in December, when all masonry work will have to be suspended until the spring of 1855.

HOW RAILROADS INCREASE WEALTH.

Inasmuch as at the present time there exists quite an outcry against some of the railroad enterprises of the day, we copy the following from a late number of the Cincinnati *Railroad Record* with the object of showing the influence of railways, and the increase of capital and the facilities of Commerce:—

Railway investments in Ohio.....	\$50,000,000
Market value	35,000,000
Increased value of lands	51,000,000
Annual gain in transportation \$7,000,000, which is interest on	100,000,000
Annual gain in interest \$1,000,000, which is interest on.....	15,000,000
Aggregate value	\$201,000,000

Deduct the original cost, and we have a clear gain of capital to the extent of 151 millions of dollars. Mr. Mansfield, the editor, thus comments:—

Try this estimate by any other test that can be applied, and it will be found to be within limits. Take, for example, the valuation of the State. In three years three hundred millions have been added to the assessments of the State, and the assessments are under valuation. Take Cincinnati as an example. In five years her Commerce has doubled. What has done it? Her bank capital is constantly diminishing, and her rates of interest are enormous. What has sustained her? But for the extension of her trade through the interior, by railways, the tyranny of legislation, and the equally bad municipal management, would almost have crushed her. The vastly

enlarged facilities for trade, and also of manufactures, have borne her triumphant through the conflict. Whence, then, originates the absurd idea, that railways have absorbed commercial capital? Railways alone have saved the commercial community from bankruptcy. Whence, then, comes this cry? This is it—Railways as well as increased currency have immensely increased the business of the country. Hence, more money is required for a greatly enlarged business. Then extravagance, to a most foolish extent, has taken possession of the wealthy classes, and that demands money. Then comes a pressure. There is overtrading, export of specie, high rates of interest, and some failures. Somebody must be blamed. Who? The most prominent, active, and public body is a railway, and he is charged with doing too much. It is the old Jack Cade cry of put down the men with the ink-horns, because they can write; and arrest the progress of railways, because they make too much business! When you cease to make railways, the goose that laid the golden egg will be killed.

INCREASE ON BRITISH STEAM AND SAIL MARINE.

The steam marine of Great Britain originated in the year 1814. In that year two steam vessels were built with a combined measurement of 456 tons. In 1820 the registered tonnage of their steamships (excluding the colonial) was 7,243 tons, vessels 43. The increase has since been irregular, showing in 1850 an aggregate of 168,344. In the same period (36 years) the merchant marine increased from 2,414,170 tons to 3,565,133 tons. The increase at various dates is shown as annexed:—

Year.	REGISTERED BRITISH SHIPPING.		STEAM VESSELS.	
	Ships.	Tons.	No.	Tons.
1815.....	21,856	2,447,831	10	1,633
1820.....	21,909	2,439,029	43	7,243
1825.....	20,701	2,328,807	168	20,287
1830.....	19,174	2,201,592	315	33,444
1835.....	20,300	2,360,303	538	60,520
1840.....	22,654	2,768,262	783	90,732
1845.....	24,368	3,123,180	917	118,782
1850.....	25,977	3,565,133	1,285	168,344
1851.....	26,043	3,662,344	...	.....
1852.....	26,086	3,759,278	...	.....

In 1852, the number of new vessels built was only 712, notwithstanding the demand for shipping for Australia, California, &c., whereas in 1847 the number was 981; in 1841, 1,192, and in 1840, 1,448. In 1825, when the trade and business of Great Britain suddenly enlarged, and speculation rife, the number of new vessels built was 1,003, and in 1826, 1,151, being much larger than in 1852. This result may be in part attributed to the greater activity of the steam vessels.

GALENA AND CHICAGO UNION RAILROAD.

This road is 145 miles in length, the distance between Chicago and Galena. The seventh annual report of the president and superintendent exhibits its affairs as in a prosperous condition. The earnings of this road from all sources for the fiscal year ending April 30, 1854, were as follows:—

From passengers	\$339,996	Mails.....	\$11,249
Freight	447,667		
Total.....			\$799,913

RECEIPTS OF FRENCH RAILROADS.

The *Moniteur* publishes the gross receipts of the French railroads for the first six months of 1854, and compares them with those of the corresponding period of 1853. There is an increase in the distance open this year of about 200 miles of rail, but the increase of the receipts is much beyond the proportionate yield of this added distance. The advance is about fourteen millions. If calculated by kilometres—four-fifths of a mile—the advance in yield of 1854 over 1853 is 2,300 francs per kilometre, or twelve per cent. This for France, and under the circumstances, is a creditable state of things.

THE COLLINS MAIL STEAMERS.

The average expenses of a voyage from New York to Liverpool and back have increased \$10,984 a trip. The increased pay is \$13,750; the increased expenses per voyage are \$10,984—leaving the actual increase of pay, under the act, only \$2,765. The increased speed on the Collins line since July 1st, 1852, has averaged two days each way over the speed made in 1850 and 1851; and this increased speed has created additional expense, together with the increased price of labor and wages. As, for instance, coal has advanced \$3 per ton, making an increased expenditure of \$5,500 per round trip to Liverpool and back—or \$143,000 for the 26 yearly trips.

The increased postage for 1853 over 1852 appears from the Postmaster General's Report to be 34 per cent. In 1852, \$339,164; in 1853, \$409,804. If this per centage of increase be taken as any criterion, the per centage of this year will be as follows: 1854, \$650,578; and for 1855, \$951,056—a sum greater than the amount paid by the government for the service. The increased postage of the Cunard line for the same time is 29 per cent. In 1852 \$655,021, and in 1853 \$845,553. Allowing the British postage to increase this year and the next at 29 per cent, the result will be as follows: for 1854, \$1,090,764; and for 1855, \$1,407,056.

STATISTICS OF AGRICULTURE, &c.

THE VALUE OF LANDS IN OHIO IN 1853.

The following table furnished for publication in the *Merchants' Magazine*, was prepared by Mr. W. D. Morgan, Auditor of the State of Ohio. It shows the number of acres sold, the prices at which they were sold, the average price per acre as sold, and the average price per acre as appraised, &c.

SALES OF LAND AS ENTERED ON RECORD IN THE SEVERAL COUNTIES, BETWEEN THE 1ST DAY OF APRIL AND 1ST DAY OF OCTOBER, 1853.

Counties.	No. of acres sold.	Amount for which they were sold.	Amount for which same lands were appraised in 1853.	Average per acre as sold.	Average per acre as appraised.
Adams.....	3,253	\$32,048	\$30,671	\$9 85	\$9 43
Allen .....	.....	.....	.....	.....	.....
Ashland.....	6,159	145,844	108,880	23 68	17 66
Ashtabula	7,309	132,402	89,690	18 11	12 27
Auglaize.....	7,299	55,083	52,384	7 55	7 18
Belmont.....	7,572	212,842	161,020	28 10	21 26
Brown	1,856	48,003	40,208	25 86	21 66
Champaign.....	5,376	130,689	117,482	24 31	21 85
Clark	4,057	147,218	107,802	36 29	26 57
Clermont	5,160	147,399	117,595	28 57	22 79
Clinton.....	2,981	84,776	72,347	28 44	24 27
Columbiana.....	7,510	194,614	163,537	25 91	21 77
Coshocton.....	2,704	54,801	34,908	20 26	13 96
Crawford.....	8,963	150,577	149,514	16 79	16 68
Cuyahoga.....	7,357	270,199	264,326	36 72	35 93
Darke.....	13,853	102,610	86,172	7 41	6 22
Defiance.....	7,884	49,154	41,952	6 23	5 20
Delaware.....	5,461	110,621	85,684	20 14	15 69
Erie	2,238	62,915	60,624	28 11	27 09
Fairfield.....	5,634	160,834	165,629	28 55	29 40
Fayette	12,704	261,292	250,789	20 57	19 76
Franklin.....	5,907	181,175	171,183	30 67	28 98
Fulton .....	.....	.....	.....	.....	.....
Gallia.....	4,245	35,392	30,181	8 34	7 11
Geauga.....	6,968	127,872	120,179	18 35	17 25
Greene.....	6,194	179,706	177,868	29 01	28 72
Guernsey.....	4,738	69,574	46,121	14 38	9 73

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Foreign railroads : a collection of 43 a



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